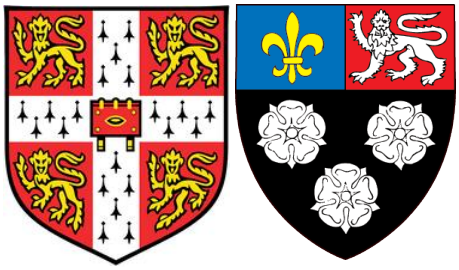
Active Ageing with Music and Technology: Meaningful Participation and the Situated Use of Technology in Community Music



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Declaration

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text. It is not substantially the same as any that I have submitted, or, is being concurrently submitted for a degree or diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. I further state that no substantial part of my dissertation has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University of similar institution except as declared in the Preface and specified in the text. It does not exceed the prescribed word limit for the relevant Degree Committee.

Section 3.1 in Chapter 3 and Study 3 in Chapter 4 have been partly published through the publications listed below:

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Abstract

Scholars and commentators have long advocated the benefits of communal artistic activity for the ageing population. The notion of "Active Ageing" also brings a new angle to the understanding of challenges and opportunities of emerging technologies. In this dissertation, I argue that recognising community music practices and technology use as situated action provides opportunities to grasp the subtleties of social participation and technology use for active ageing. Qualitative and quantitative enquiries were used to (i) uncover the experiences of meaningful participation and the situated use of technology in community music; (ii) unpack the psychological basis of meaningful participation that is sustained by technology use. Drawing on social practice theory by Elizabeth Shove and the situated action approach by Lucy Suchman, this dissertation contributes a productive context of technology use to the richly researched area of community music with older people, and illuminates the complexities of community music practices and the ways in which technological devices coordinate the practices and the implications for active ageing.

Two empirical chapters address the two research goals, respectively. Chapter 3 uses qualitative methods and identifies music practices mediated by technology, such as music sharing and revisiting, and how these practices evolve through the reconfiguration of connections between technological devices, competence, meanings, and forward-facing identities. Identity development, via routes such as exercising control, role transitions and social spaces, has psychological significance and implications for the broader concept of active ageing. Building on these findings, we further elucidate how self-efficacy (an exemplar of competence) and motivation (an exemplar of meaning) are associated with the use of digital music technologies (an exemplar of technologies for community music participation) in Chapter 4. Two sets of use patterns that emerge from the quantitative survey data, Contributing and Active interacting, further lend support to the qualitative data. The use of digital music technologies was not determined exclusively by age and employment status, but also by music group memberships and music-technology-specific self-efficacy. Getting social connectedness was a key motivation for more frequent use and sharing using digital music technologies. These results also suggest that age is relevant in thinking about why technology

is used in the participants' particular ways. Drawing upon these findings, I wrote about how HCI can leverage the tenets of active ageing and might facilitate older people's meaningful participation in community activities with digital music technologies.

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Chapter 1 Introduction

1.1 Motivation and Objectives

The world's population is ageing. Ageing has become a significant topic of research across many disciplines. One of the timely challenges faced by high-income countries is that "*new cohorts of highly educated, skilled, and increasingly healthy populations are approaching traditional retirement ages and are increasingly remaining in economic activity*"[1]. The new older cohorts are experiencing various life changes that are not only caused by age, but also and more likely by factors such as "*the changing societal values, consumer choices, and technological innovations*"[2]. Accordingly, societal and cultural attitudes towards the stereotypical "older age" have been shifting to a more active (e.g., the policy framework of "Active Ageing" first raised by the World Health Organisation, 2002) and multifaceted view (e.g., the "life course" perspective of ageing, see World Health Organisation, 2002). In response to these challenges, the active ageing literature and policy centres on the importance of social participation and have provided a wealth of evidence that active participation is beneficial for health and psychological well-being in later life.

As information and interactive technologies[3] are continually incorporated into people's everyday lives, their routine practices have expanded in a complex and dynamic manner and

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[1] http://trend.pewtrusts.org/en/archive/winter-2018/as-the-world-ages-when-older-populations-become-the-majority

[2] https://www.forbes.com/sites/josephcoughlin/2018/01/29/more-than-avocado-toast-how-millennials-will-make-retirement-better-for-baby-boomers/#1994644177ee

[3] In this dissertation, the term "technology" refers to interactive information and communication technologies. Terms "artefacts", "tools" and "devices", unless specifically stated, are used interchangeably with "technology".

are increasingly dependent upon a range of digital possessions and technological tools. The convergence of ageing, social participation, and technology opens up new opportunities for people to participate in activities and maintain social relationships in later life. Over the last two decades, Human-Computer Interaction (HCI) and human factors research relating to the elderly has been dominated by deficit-driven approaches when designing and developing technologies (Vines, Pritchard, Wright, Olivier, & Brittain, 2015). As a consequence, a wealth of research treats ageing as a "problem" to be fixed and has been focussed on developing assistive systems to overcome cognitive and physiological deficiencies. However, influenced by the social and critical gerontology literature and the notion of "active ageing" proposed by the World Health Organisation, researchers have recently suggested a more active way to reconfigure old age in HCI. They argue that older adults can actively engage in social activities and give back to the community (Brewer & Piper, 2016; Morreale, Moro, Chamberlain, Benford, & McPherson, 2017; Morrissey et al., 2017), so as to maintain physical health and psychological wellbeing. Also, HCI researchers call for the consideration of the heterogeneous nature of ageing, as only considering age differences may limit the scope of research and mean that it is not able to draw the whole picture of technology use and ageing actively. Within studies in this strand, everyday technologies are either critically examined against (Rosner, 2016), or sensitively adapted to, the situated needs of participants (Lazar, Edasis, & Piper, 2017), or (re)-invented within the elders' familiar interaction concepts in the context of such activities (Vines, Blythe, Dunphy, Vlachokyriakos, Teece, Monk, & Olivier, 2012). As such, reflecting on how individuals' life courses impact their experiences of growing old and contextualising such experiences in technology use are sensible ways to benefit HCI and active ageing research.

This dissertation is also motivated by a research project on ageing and community arts – "New Dynamics of Ageing"[4] (NDA). Community artistic activities, including community music, embrace "*the active participation of an ongoing dialogue with individuals and groups*" socially and inclusively (Creech, Hallam, Varvarigou, & McQueen, 2014). By the conclusion of the NDA project, it becomes clear that community music enhances wellbeing

[4] http://www.newdynamics.group.shef.ac.uk/

in later life, via routes that include building purposes, enabling autonomy and control, and reinforcing social affirmation (Bartleet & Higgins, 2018). However, although the theoretical and practical values of active participation in community music are clear enough, it is still unclear how people take an active role in community music participation, how and why they experience community music in their later life, and how their experiences and participation are associated with the desired outcomes of active ageing. Moreover, the prevalence of cloud-based technologies and streaming services may open up new opportunities for community music. Community music practitioners have been interested in exploring the ways in which these technologies could support their practices (Doebele, 2012). To this end, an investigation into how digital music technologies are used, interpreted, and adapted to the situated needs of community music participants would contribute to the NDA project and the literature of active ageing and HCI. Throughout the whole dissertation, unless specifically stated, "digital music technologies", according to Krause and North's (2014) definition, refer to "technology, application, and devices that allow users to interact with music digitally". Such technologies include, but are not limited to, online streaming services (e.g., Spotify, Grooveshark, Last.FM, Amazon Prime Music), social systems with musical functions (e.g., YouTube), music applications (e.g., iTunes), and tools and devices in relation to music use (e.g., MP3s, tablets, mobile phones, and wireless sound systems).

This dissertation set out to investigate active and meaningful participation and technology use in later life in the context of community music. The overarching research question is: **How do people use technology through meaningful participation in community music?** The chapters that follow circle around a few interrelated research questions: How do late middle-aged and older people participate in community music activities? How is the situated use of technology associated with meaningful participation? What is the factor structure of digital music technology use and how is it associated with demographics and domain-specific self-efficacy? How do motivations influence the use of digital music technologies, and how are motivations associated with age and group membership? In the rest of the chapter, we[5]

[5] Throughout the whole thesis, unless specified, "we" refers to myself and the supervision and guidance that I have received from my supervisors.

outline an overview of theoretical foundations in connected fields that this dissertation builds on, the research gaps to which these questions are related, a summary of community music, an overview of methodology, expected contributions, and the structure of the whole dissertation.

1.2 Thinking about Growing Old

To begin with, a brief overview of the definition of "old age" in gerontology and related fields is necessary. A common theme across different disciplines is that the definition of the "ageing population" is not as simple as it might seem. Gerontologists conceptualise ageing in terms of four distinctive processes: *chronological ageing*, which defines ageing on the basis of the year of birth; *biological ageing*, which identifies ageing based on the physical changes that mean that organ systems become less efficient; *psychological ageing*, which focuses on how people sense, perceive, mentally process, and adapt to the process of growing old; and *social ageing*, which deals with one's changing roles and social relationships, implying that the changing social context determines the meaning of ageing for people, aside from one's chronological, biological, and psychological ageing (Hooyman & Kiyak, 2008). Drawing on the four processes in the gerontology literature, three ways of defining ageing are prevalent in literature: (i) the definition with a cut-off at a certain age (e.g., the historical age of retirement – 65, or the year of age that an individual begins receiving their pension); (ii) the definition with a certain life stage (e.g., the Third Age by Laslett, 1991); (iii) the **definition with perception and actions in terms of social relations**, by characterising how people perceive the situation and approach the challenges in later life (Lindley, Harper, & Sellen, 2009). The first definition has been found to be inconsistent, less useful, and even problematic (e.g., Bowling & Iliffe, 2006; Lazar et al., 2017; Rozanova, 2010). The second way of defining old age has been criticised as flawed, especially in the critical gerontology literature, for not covering the diverse and dynamic nature of ageing (Vines et al., 2015). The third definition, echoing the propositions of social gerontology and the "life course" perspective, is finding more space in gerontology and connected areas (e.g., HCI). Life course is a broad concept that takes social, cultural, and historical contexts into account when examining how people

age (Hooyman & Kiyak, 2008). There is a recent shift in focus, advocating for the framing of ageing as an experience of continued growth and participation in family, community, and social activities, regardless of physical and cognitive constraints (Hooyman & Kiyak, 2008). This shift in focus tackles the drawbacks of the other two ways of defining old age with an inclusive and forward-facing perspective. To this end, studies following this definition often include later middle-aged adults (people aged 55 and above). Throughout the whole dissertation, we use the terms "older adults/early retirees/the elderly/elders" to refer to people who move from commonly productive lives to a period of life during which some changes in their occupational situations take place (e.g., retirement, semi-retirement, self-employment, or volunteering work), whilst remaining autonomous and active in life (Durick, Robertson, Brereton, Vetere, & Nansen, 2013; Lindley, Harper, & Sellen, 2009).

The shift from deficits to continued growth and active participation in community and social activities in older adulthood has been well grounded in the policy framework of active ageing (World Health Organisation, 2002). The model of active ageing is against views that problematise ageing and regard deficits in older adulthood as problems that any form of interventions (including technological interventions) can solve. Instead, the policy framework of active ageing advocates activities and programmes for social engagement, personal development, and even societal change. Popular in research, media, and policy, active ageing draws related fields (e.g., music, online community; see a study by Carroll, Convertino, Farooq, & Rosson, 2012) together in creating new forms of engagement and development. One such example is the New Dynamics of Ageing (NDA)[6] project that partly motivates this work. Scholars in active ageing have widely agreed that active participation is beneficial for health and well-being in old age (e.g., Adams, Leibbrandt, & Moon, 2011) and claim that older people can make active contributions to their health and well-being through participation in activities (e.g., Stenner, McFarquhar, & Bowling, 2011). Moreover, researchers call for more nuanced and subtle "lay models" of active ageing, so as to grasp why and how people experience their later lives in their particular ways (Bowling, 2008; Clarke & Warren, 2007; Stenner et al., 2011). This strand of thought further requires a

[6] http://www.newdynamics.group.shef.ac.uk/.

nuanced and situated understanding of the meanings of participation, which is among the least addressed elements of social participation in the literature (Adams, Leibbrandt, & Moon, 2011).

One way of attending to the subjective meanings and situated experiences of active participation is to examine how one's *sense of self* and *social identity* develop through participation. Social identification with groups structures people's perception and action (Reicher & Hopkins, 2016). Social psychology research explains the mechanism underlying such associations. One strand of thought argues that the image of a group emerges and grows as people participate. An individual's knowledge of belonging to certain social groups and the value and emotion accumulates with such images (Tajfel, 2010), and may be further constituted through constant interaction with others (Marwick & Boyd, 2011). Another mechanism adopts a self-categorisation approach (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) and argues that the processes of social identification are future-oriented and dynamic (Reicher & Hopkins, 2016). From the interactionist perspective (Blumer, 1986), the future-oriented selves guide actions in people's lives by organising future-oriented behaviour (Markus & Nurius, 1986) and contributing to the ability to conduct possible actions learnt from others' salient selves (Mead, 1934). In the active ageing literature, a few studies contribute to the knowledge with respect to the construction and development of individuals' *sense of selves* (e.g., musical possible selves in Creech, Hallam, Varvarigou, Gaunt, McQueen, & Pincas, 2014) and *social identity* (e.g., a sense of belonging in Brewer & Piper, 2016) through active participation in later life. Collectively, the psychological approach of understanding identity development provides a useful angle with which we can understand the subtleties of ageing and the dynamic social relationships in later life (Frazier et al., 2002).

To elaborate on the link between identity and actions, we introduce another psychological construct here – *motivation*. A wealth of research on active ageing has demonstrated that people engage in personal and social activities because they perceive these activities as meaningful and valuable. A sense of purpose and meaningfulness direct attention and efforts towards activities in line with their purposes and goals (Gollwitzer & Wicklund, 1985). In the meantime, participants' social identities are formulated and enacted through participation

(Tajfel & Turner, 1986). In other words, motivation in the psychology literature, according to Markus and Nurius (1986), functions as the efforts that relate the purposes and goals mediated by future-oriented identities to actions. Moreover, in the social practice theory literature, motivation is seen as one of the constituent elements of practices and is interdependent upon other elements, such as "*forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge*" (Reckwitz, 2002, p. 249). Shove, Pantzar, and Watson (2012) use the term *meaning* that encompasses mental activities, *motivations*, and emotions to represent the "social and symbolic significance of participation" (p.23). Meanings are interdependent on what people *do* and *have*. An understanding of the "lay theorising" of practices can inform the meaning and, in particular, the motivations of accomplishing the practices. To this end, examining motivation from the perspective of identity and social practice theory may add to the active ageing literature on how the situated experiences and motivations of participation are represented and communicated within the system of self in old age.

Another theoretical concept to add here is *self-efficacy*, which refers to the judgement of one's capabilities to perform a given task. Growing old often comes with various life changes. Research on active ageing and successful ageing has demonstrated that one way in which people deal with potential challenges and uncertainties in later life is to obtain skills and *self-efficacy* through social participation. In psychological studies, self-efficacy is a key "regulatory mechanism" – the psychological processes of acquiring skills and obtaining confidence alter efficacy expectations, and further determine human actions and strategies in the face of challenging situations (Mun & Hwang, 2003). In the social practice theory literature, people's knowledge and skills, alongside their efficacy beliefs (or confidence, in the vocabulary of Shove's social practice theory) that they have the required knowledge and skills to accomplish the valued practices are all referred as *competence*, an essential constituent element of practices (Shove, 2007).

Ageing and technology use is also of interest in the HCI community. Earlier human factors research has long been dominated by the "deficit discourse" and attempts to design assistive

technologies (e.g., systems to prevent older people falling, remote communication tools in support of contacting children and grandchildren, patient-caregiver/relatives communication, and multimedia tools in support of reminiscence; see Righi, Sayago, & Blat, 2017; Vines et al., 2015). Alternatively, a wealth of HCI research has been focusing on specific problems in relation to technology use among older adults, such as accessibility, usability, and privacy (e.g., Chin & Fu, 2012; Neves, Franz, Munteanu, Baecker, & Ngo, 2015; Vines et al., 2013). Moreover, there is a tendency towards the use of psychological constructs drawn from behavioural theories such as Technology Acceptance Model (TAM, see Davis, 1989) and Theory of Planned Behaviour (TPB, see Ajzen, 1991). This line of research treats behaviour (or behavioural intentions) as outcomes of technology use, and individuals' beliefs, attitudes, motivations, and experiences as predictors. However, such research is insufficient to inform how and why technology is used in the elders' particular ways. Another potential problem lying in these perspectives is that the older population has been treated as a homogeneous group with limited or declining cognitive, physical and social capabilities (Vines et al., 2015). Although the past research based on these perspectives is not inherently wrong (Vines et al., 2015), it is of limited help in attending to the gap in active ageing literature – a subtler understanding and lay meanings of active and social participation (Stenner et al., 2011). This gap of knowledge, alongside technology use, raises further questions: How do older community music participants use existing ICTs such as e-mail and technological systems that are new to them[7] (e.g., music streaming services, social media)? Do they use these technologies differently from the initially designed functionalities that the manufacturers and designers have in mind? If so, why do they use these technologies in their particular ways?

A growing number of HCI studies have begun to attend to the gap of knowledge in active ageing by investigating elders' experiences and perception about socialisation in "situated communities" that they already interact with (e.g., Righi et al., 2017). A recent shift in HCI centres on activities, communities, technological devices, and contexts that older people are already familiar with, by developing technologies to meet their natural needs or examining in

[7] Throughout the whole dissertation, unless specifically stated, "new technologies" in our context refers to technologies that are relatively new to our late middle-aged and older participants. "New" does not necessarily mean immediate technological innovations.

what ways existing technologies could better meet their needs (see Lazar et al., 2017). In particular, researchers direct attention to how technology use is situated in everyday life and social activities (Suchman, 2002; Vines et al., 2015), and how "action, context, social and technological factors" mutually influence the use of technology (Lindley, Coulton, & Sturdee, 2017). In this dissertation we adopt Lucy Suchman's notion of situated action, which argues that "*every course of action depends on essential ways on its material and social circumstances*" (Suchman, 2007, p. 70). The situated action approach decentres the role of technology and challenges the undifferentiated use contexts of technology in prior behavioural theory-based studies (e.g., studies that adopt TAM; see also Lindley et al., 2017). Instead, technologies only become meaningful when they have been artfully integrated into people's routine practices. Also, in terms of active participation in later life and the related constructs that we have mapped out before, individuals' identities, motivations, and efficacy beliefs are no longer stable human characteristics, instead, these constructs are well grounded in the dynamic, contextual, social, personal, and technological environment. As such, the situated action approach resonates with the call for the subtler understanding of social participation in the active ageing literature and may contribute to HCI research by informing how and why certain technologies or interventions fail to be configured into practices.

In sum, prior research in active ageing, successful ageing, gerontology, psychology, and sociology suggest that active participation practices in later life are a complex set of routines that encompass older people, things (i.e., possessions and technological devices), individuals' sense of self, social identities, motivations, skills and self-efficacy. Existing research makes it clear that active participation enhances health and well-being. However, research on how and why people experience old age and participate in social activities in later life and how they play an active role in participation is still in its infancy. This dissertation builds upon this strand of thought and examines the development of community music practices alongside technology use, as well as their individual and collective nuances among later middle-aged and older people. The rationale for including later middle-aged participants is in line with the definition of ageing with perception and action in terms of social relations (see page 5).

1.2 Thinking about Growing Old

This dissertation has two related objectives. The first objective is to uncover the experiences of meaningful participation and the situated use of technology in community music. Findings that draw from this objective look predominantly at late middle-aged and older people. This objective encompasses two questions. First, we ask, **how do late middle-aged and older people participate in community music activities**? Satisfying this research question requires enquiries into what motivate people to engage in community music, who the participants are, what they do as routine practices, and how their "career" (Shove et al., 2012) of participation develops. This open-ended question aims to set the scene for the further lines of enquiry with regard to technology use in the context of community music.

The second research question to address is: **how is the situated use of technology by late middle-aged and older people associated with meaningful participation**? Rather than focusing on what "problems" technology could fix for late middle-aged and older community music participants, this dissertation aims to investigate how the participants use technology in support of their meaningful participation, what challenges may arise, and how they would respond. Echoing the social practice theory, here we framed the technology as "an existing presence embedded in social routines" (Vines et al., 2015).

The second objective of this dissertation is to unpack the psychological basis of meaningful participation in community music in terms of the situated use of digital music technologies. We are not suggesting that digital music technologies (see the working definition in section 1.2) are the only type of technology of relevance to community music practices. However, it is conceivable to choose digital music technologies as an exemplar of a range of technologies, because the prevalence of these technologies emerges from our qualitative data, and community music practitioners have been interested in the opportunities brought by these technologies in support of their routine practices (Doebele, 2012). The existing digital music applications, although widely known and used by people in general, are not designed for older people nor group music engagement in particular. Therefore, it is our aim here to start from digital music technologies, to contextualise their use patterns and psychological basis with our previous qualitative findings, and to validate the situated use of these technologies for community music. The third and fourth research questions in this dissertation address this

second objective, as well as further validating the qualitative findings drawn from the first two research questions. Instead of predominantly recruiting participants who are late middle-aged and older, enquiries for this second objective include people who are relatively younger and compare between the older and younger age groups. The third research question is: **What is the factor structure of digital music technology use, and how is use associated with demographics and domain-specific self-efficacy**? For this research question, we are particularly interested in understanding the association between the psychological construct of self-efficacy and the situated use of technology.

Fourth, the psychological basis of motivation is investigated by asking, **how do motivations influence the use of digital music technologies, and how are motivations associated with age and group memberships?** Again, we are not going to provide immediate answers to what specific functions should be designed nor invent a killer digital music application that will work in similar situations. Before doing that, it is essential to understand how existing digital music technologies are used, and how the usage patterns are contingent on routine practices of community music, and how the use of digital music technologies is associated with individual differences and the psychological construct of motivation.

In framing these interrelated research questions, we use social practice theory as a conceptual framework[8] (Shove, 2007) to navigate between the perspectives and approaches outlined above. The theory of social practice by Shove has been found useful in navigating between multidisciplinary perspectives and methods (Shove, 2007). Social practice theory sides with Giddens (1984) and Taylor (1971) and conceives practices in terms of the mutual effects between individual actors and social relationships. This strand of research discusses practices around time and space[9] when conceptualising practices and the constituent elements. Taking the "elemental approach", Shove et al. (2012) de-centre the role of human actors and focus on

[8] The specific emphasis on social practice theory and the singled-out elements (i.e., things, competence, meaning) was not determined in advance. Instead, the appropriateness of this model became evident during the data analysis and synthesis phase of this dissertation (especially Chapter 3).

[9] Schatzki (1996) defines practice as "a temporally and spatially dispersed nexus of doing and saying". Reckwitz (2002) puts it further by conceptualising that practices exist "through the immediacy of doing" and consist of interdependencies between the diverse elements over time.

doing and the centrality of "linkage" that connects between elements that renew over time and mutually evolve. There are three elements to consider in Shove's theory (see Figure 1-2 for a reproduced conceptual framework of Shove's social practice theory):

- **Things**, also called "material" or "stuff", which includes artefacts, technologies, physical entities, and material of which objects are made (Shove, 2007). In this dissertation, we are primarily interested in community music participants and things that include digital music technologies and music possessions in relation to community music practices.
- **Competence**, which is referred to skills, techniques, mental activities, background knowledge in the form of understanding, and know-how around the practice (Reckwitz, 2002). A background practice-based experience and the ability to re-contextualise the knowledge is essential to grasp competence (Shove et al., 2012). This dissertation adopts a loose definition of *competence*, which refers to domain-specific self-efficacy of using music-related technologies, music skills, as well as the practical knowledge of music making and technology use.
- **Meaning**, which refers to symbolic meanings, ideas and values that are significant to participation (Shove et al., 2012). Meanings become meaningful in practice through a dynamic process of association, and can be "unpacked" through a local process that is highly configured by the "local relations, histories, and conditions" (Shove et al., 2012, p. 57). Here we also adopt a loose definition of *meaning* that include motivations, self-identity, collective identity, ideas, and aspirations in relation to community music participation and technology use.

The two objectives lie between several disciplines, including social psychology, gerontology, sociology, and HCI. It is the focus of this dissertation to revisit literature from connected fields and to draw on our findings so as to examine what community music participation means in later life and how community music practices develop alongside technological innovations. To give readers a better understanding of the context of community music, we then briefly review its definition and justify the relevance of community music to the core research questions that are explored in this dissertation.

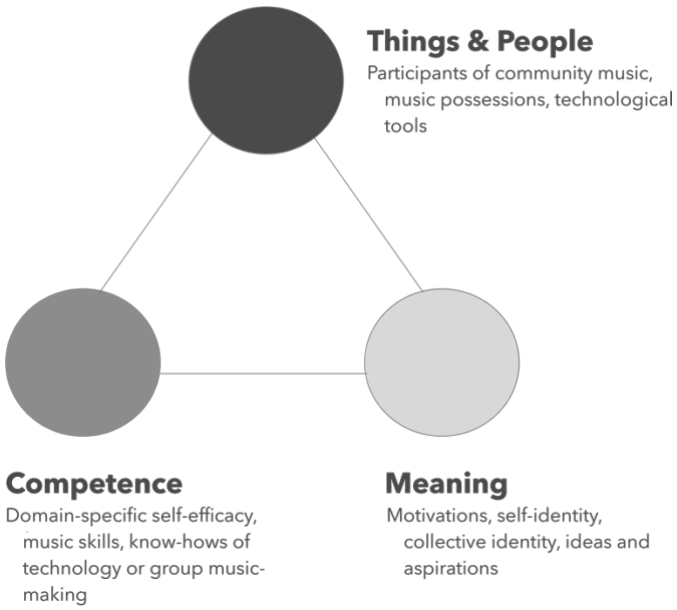

Figure 1-1 The elements of community music practice, reproduced based on Shove et al., 2012

1.3 An Overview of Community Music

Understood in the context of UK, the term "community music" traces back to the community arts movement of the early 1970s – advocating a tool of action that focused on freelance music making outside of formal educational institutes (Higgins, 2007). The term "community music" has not been defined in a standard manner because of its diverse, complex, multifaceted, and contextual nature (Higgins, 2012). Characterising community music from the vision of "community" is widely supported by researchers who advertise the sociological roots in this area. The general use of the term "community" is a ratification of community music's emphasis on the group rather than individual work (Higgins, 2007). A direct definition describes community music as a type of music made by any community (Ansdell & Pavlicevic, 2004). A broader perspective of understanding "community music" is "an active intervention between a music leader or facilitator and participants" (Higgins, 2012). In this definition, "community music" is referred to as an approach of activating people to get involved in music making or learning in general with the consideration of participation, context, and diversity. Following this definition, "community music" takes many forms

ranging from singing groups, community choirs, music festivals, and short-term workshops, as well as music-related classes taught in community institutions such as the Universities of Third Age (U3As).

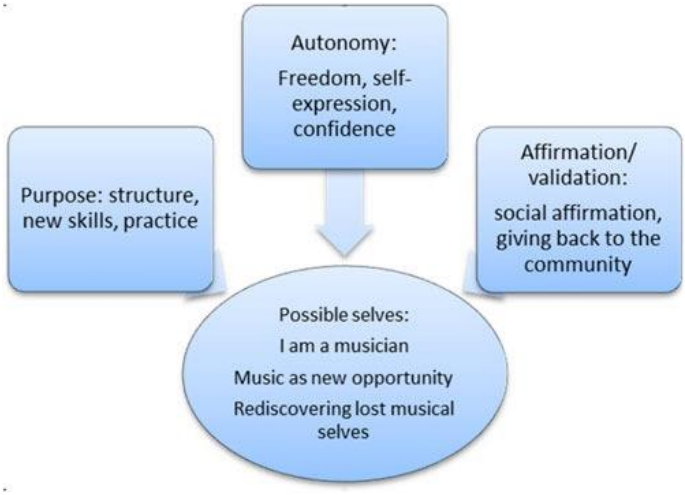

Figure 1-2 Possible selves in community music and related facets of well-being (Source: Creech, Hallam, Varvarigou, Gaunt, McQueen, & Pincas, 2014)

A wealth of research in community music highlights its benefits for older people. On the one hand, community music creates a space for socialisation and volunteering work (Taietz, 1976). The building of music communities is based on individuals' interest, social orientation, social position, and structural factors (e.g., location, financial status). Music communities vary in size, scope, and style (Higgins, 2012). On the other hand, community music projects entail various levels of creative engagement and artistic progression (e.g., Kankainen & Lehtinen, 2011; Luborsky, 1994). Participation in community music activities has been widely embraced by older people because of its benefits of (i) sustaining health and psychological well-being (e.g., a sense of belonging and the perception of playing a vital/active role in a community); (ii) acquiring new skills and getting opportunities for intellectual stimulation; (iii) social capital and affirmation obtained from helping others and engaging with social activities; (iv) redefining or recovering one's musical self-concept (Creech, Hallam, McQueen, & Varvarigou, 2013). Moreover, Creech, Varvarigou, Hallam, McQueen, & Gaunt (2014) claim that music group participation contributes to an enhanced

level of senses of purpose, autonomy, and social affirmation, compared to non-music group participation (see Figure 1-2). As such, community music embraces the contextual and heterogeneous knowledge of "active participation" without an overfocus on the downside of ageing (Vines et al., 2015).

1.4 An Overview of Methodology

At a general level, this dissertation uses qualitative and quantitative approaches. To understand meaningful and active participation and the situated use of technology in the context of community music, we start with an "interpretive paradigm" (Hathaway, 1995) to first establish an understanding of the phenomenon and the research space around community music. In this dissertation, "paradigm", following Thomas Kuhn's notion of "paradigm shift" in his book The Structure of Scientific Revolutions, is understood as "*a theoretical framework, or a way of perceiving and understanding the world, that a group of scientists has adopted as their worldview*" (Hathaway, 1995, p. 541). This dissertation uses the concept of "paradigm" to uncover the epistemological assumptions underlying the choice of qualitative and quantitative methods. An interpretive paradigm assumes the importance of researchers' subjective and empathetical understanding of the phenomenon and the experiences of participants in natural settings (Hathaway, 1995). The interpretive paradigm resonates with Vine et al.'s (2015) call for engaging with older adults "*as participants in research in the first instance*" and "*reflect upon how their personal histories impact upon technology use now and in the future*" (p. 2:19) in HCI research. The first and second research question in this dissertation are concerned with the situated practices of community music and the use of technology, which calls for a methodology that is sensitive to the lived and subjective experiences of participants and the social and technological contexts. To this end, it is appropriate to use an interpretive paradigm to answer these two open-ended research questions. In particular, qualitative approaches – participant observation, contextual interviews, diary, and semi-structured interviews – are used so as to obtain the knowledge of the fabric of community music culture and activities, its participants, as well as the

participants' motivations, skills, efficacy, values, and attitudes that constitute community music practices in old age.

With a modest foundation that has been established with the interpretive paradigm (research question 1 and 2 in Chapter 3), we then elaborate on and challenge these findings with an "empirical-analytical paradigm" (Hathaway, 1995). The empirical-analytical paradigm, according to Hathaway (1995), "*presupposes an independent reality and then investigates how we are part of that reality and how we know that reality*" (p.545). It is characterised by the "researcher's detachment" from the research setting. The epistemological assumption of the empirical-analytical paradigm is that the knowledge to be studied is the objectively measured "*a priori* analytic categories" of the research setting (Hathaway, 1995, p. 546). There are two reasons for shifting from the *interpretive* to the *empirical-analytic* paradigm. First, findings drawn from the interpretive paradigm in Chapter 3 provide an analytical framework to interpret the phenomenon of technology use and are subsequently used as the a priori categories guiding our empirical-analytic approach. Here we have to note that this dissertation is entirely different from the one imagined at the beginning of the PhD. Initially, this PhD was positioned as a purely empirical-analytic project that set out to unpack critical psychological constructs with respect to older people's technology use in community music. As the research developed, however, there was an increased awareness of the importance of the contextual and social settings of community music participation in which technology involves. This tendency has been highlighted by Lucy Suchman's (2007) work on the situated action of human-machine interaction. To this end, we started the whole dissertation with an interpretive paradigm and later shifted to the empirical-analytic approach to further investigate the impact of some psychological constructs that are meaningful and well situated in people's community music practices. Also, by contextualising the quantified factor structure of technology use and the effects of psychological constructs, we can validate the propositions derived from different scientific paradigms and provide a nuanced picture of community music practices and technology use. Second, we are interested in knowing how the particular phenomenon of community music in old age theoretically compares to other types of social participation, and whether age is significant in the situated use of technology. This tendency calls for the empirical-analytical approach, with which objective evidence on

the magnitude of the effects of psychological constructs (i.e., motivations and domain-specific self-efficacy) and demographics can be collected. To this end, we use prior literature and the findings from the interpretive paradigm as a priori analytic categories, and design and conduct two quantitative studies with two independent samples to investigate the uses and perceptions of digital music technologies among community music participants.

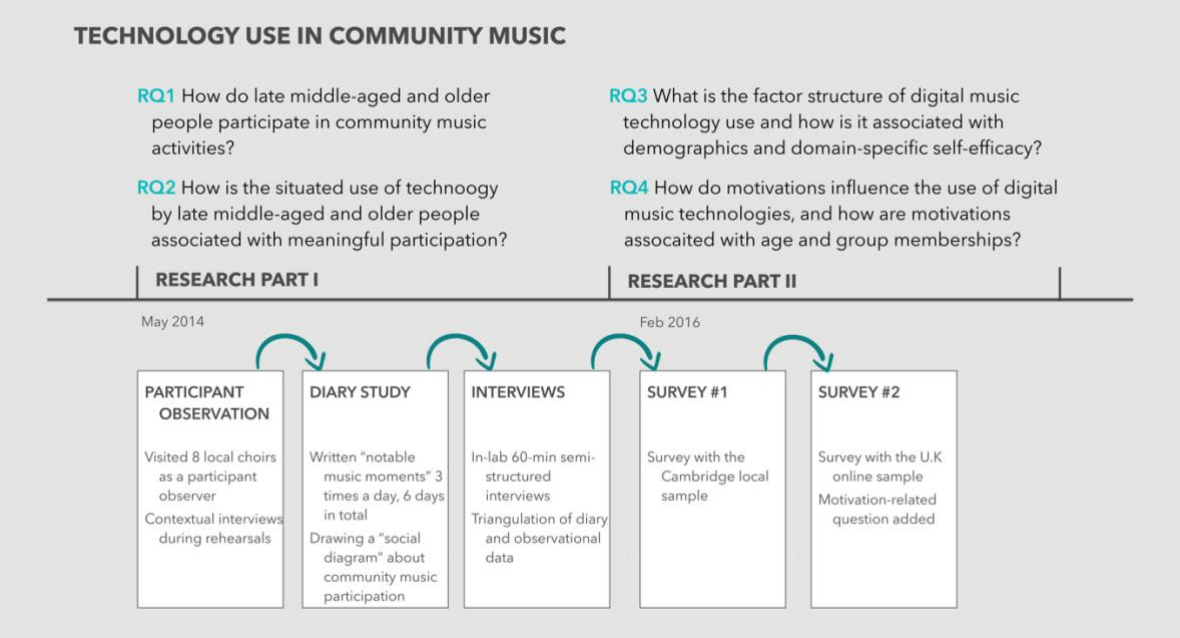

Figure 1-3 Research progress of this dissertation

Aside from the two general research paradigms, this dissertation adopts the following methods (see Figure 1-3 for an illustration of the four research questions and what specific techniques were used to answer each of them):

- **Participant observation and contextual interviews**, with 8 community choirs in Cambridge during 15 visits, to get a preliminary view of how people participate in community music practices.
- **Diary study**, with 11 participants, on daily music-related activities and the use of conventional and digital technologies, as well as the perceived structure of social relations relevant to music.

- **Semi-structured interviews**, with 11 participants, on the experience and practices related to community music, use and perception of music-related technologies and other Internet-based technologies.
- **Survey questionnaire**, with a Cambridge local community music sample ($n = 77$) and a UK-wide sample ($n = 153$), on themes that include: 1) the use and sharing patterns with respect to digital music technologies; 2) individual differences and psychological constructs.

1.5 Contributions

This dissertation offers three core contributions. First, empirically, this work provides a more productive and nuanced understanding of ageing and technology use in the context of community music. This work contributes an empirical case of the situated use of technology among community music participants and the empirical evidence with respect to how community music practices develop with the incorporation of new technologies, people's accumulated skills and efficacy, as well as their motivation and identity development. As such, the "lay theorising" and subjective meanings of active ageing are revisited and enacted critically here. Moreover, inspired and guided by the findings from the qualitative studies (Chapter 3) in this dissertation, two quantitative survey studies were conducted, the results of which were further contextualised with the rich and nuanced picture of community music practices. To this end, this work also adds a small brick of knowledge to research attempting to unpack technology adoption and usage by the "statistically-ageing population" (Vines, 2011).

Second, theoretically and analytically, this dissertation aims to contribute an analytical model of thinking about technology use in later life, by illuminating the complexity of community music practices, and the interwoven configuration of people, technology, and contexts. Such a model provides an alternative interpretation of the situated use of technology in the context of community music to open up new conversations about active ageing and its interaction with digital music technologies. Such understanding is essential to the active ageing literature

(and successful ageing as well), in the sense that these subtleties and nuanced meanings of participation and technology use detail the psychological mechanisms and routes through which active music participation contributes to health and well-being in later life.

Third, this dissertation provides practical implications for practitioners of community music and active ageing. Our work extends the model of active ageing with community music proposed by Creech, Hallam, Varvarigou, and McQueen (2014) by adding the contextualised knowledge of technology use, and by detailing the ways in which the interwoven configuration of community music participants, technologies, people's skills and efficacy, as well as motivations and meanings takes place. It was hoped that, by knowing how community music practices develop and the role in which technology plays, community music practitioners would be able to sensitively design programmes and adjust their strategies for intervention, counselling, and education.

In exploring and examining the four research questions, this dissertation engages with a range of issues situated at the intersection of different disciplines: social psychology, gerontology, sociology, and HCI. This dissertation seeks openness in terms of the understanding of the holistic and co-dependent culture of community music practices and the knowledge with respect to the psychological significance of such practices and their constituent elements. Rather than discussing these in abstract, a series of empirical studies are reported in Chapter 3 and 4 that, in combination, allow us to address the two central objectives mapped out above.

1.6 The Structure of the Dissertation

This introduction chapter contextualises this dissertation within the community music culture in the UK and the perspective of active ageing in research and practice, and generally reviews the theoretical concepts that will be discussed along the way. Chapter 2 provides a detailed review of social participation, identity development, and technology use and adoption in light of the broader context of active ageing. Chapter 2 concludes with highlighting the gaps of knowledge in terms of the subtleties and subjective meanings of social participation for active ageing, how participation is mediated by technology use, and how these interwoven practices

could enhance active ageing. As such, we justify why it is essential to research older people's community music participation and technology use and ground the four interrelated research questions in this dissertation (see section 1.2) in the literature. These two empirical chapters (Chapter 3 and 4) will be used to answer the four research questions.

Chapter 3 begins with a general question: how might we interpret meaningful participation in community music? We aim to set the scene for further empirical enquiries by answering this question. This chapter uses participant observation, diary study and semi-structured interviews. Two sections in this chapter are drawn from different parts of the data collected. In section 3.1, using data from the participant observation, the diary study and part of the interviews, we study how people get "attracted" and "recruited" into community music, and how they become committed members. To explore what people do and what *doing* means for them, we conducted an anatomy of how people learn music in groups in terms of time and space. In particular, two types of music learning patterns in community music participation are identified: *formal* and *informal* music groups. This dichotomy has significant implications for further discussion in this chapter and chapter 4 that follows. By reporting the findings, this section identifies three characteristics of meaningful participation in community music: accumulation of competence, collective identity and identification, and the distribution of music possessions and technological devices. The conceptualisation and interpretation of meaningful participation brings new research questions into view: what role does technology play in meaningful participation? How is the situated use of technology associated with meaningful participation? Do community music practices develop with the incorporation of new technologies? If so, how do the practices develop?

These questions are answered in section 3.2. Section 3.2 is mainly drawn from the interview data and partly from the diary data (mostly the "social diagram"). It is also further validation of findings in section 3.1 drawn from participant observation and contextual enquiry. Key practices of community music in which technological devices are incorporated are identified – music sharing and revisiting. The provisional conclusions with regard to the differences in learning music between formal and informal community music groups are used here to investigate further how and why people experience community music practices in their

particular ways. The perspective of social practice theory leads us to the observation that technology legitimates its use through an enduring configuration between practices and their constituent elements of practices that include identities, skills and self-efficacy, and motives. We then uncover how the situated use of technology is linked to people's competence, identity development, and motivations. What also emerges from section 3.2 is the prevalence of digital music technologies in coordinating music sharing and revisiting practices, which introduces further lines of enquiry: how digital music technologies are used by middle-aged and older people who participate in community music and those who do not? How are their uses of digital music technologies associated with demographics and psychological constructs in relation to competence and meaning of community music practices? The two questions are explored in Chapter 4.

Chapter 4 further lends support to the qualitative findings concerning the conceptualisation of meaningful participation and the situated use of technology using an exemplar of technologies of relevance – digital music technologies. Two studies are reported to elucidate how domain-specific self-efficacy and motivations are associated with the use and sharing patterns with digital music technologies, respectively. Study 2 starts with specifying the bundled use patterns of digital music technologies across a sample with local community music participants in Cambridge and an online sample in the UK. Two bundled use patterns of digital music technologies are identified: Contributing (or Socialising & Contributing) and Active interacting. To further understand the psychological basis of digital music technology usage, a series of demographic and psychological correlates are analysed. The substantial effect of music group membership, when contextualised with qualitative findings from Chapter 3, further lends support to the different learning patterns across informal and formal community music groups, as well as the cumulative nature of community music participation. These results suggest the meanings conveyed in technology use and community music practices, and drive us to examine participants' motivations for using digital music technologies and the associations with community music practices in study 3.

Study 3 elaborates on the effect of motivations on the uses and sharing patterns of digital music technologies among the U.K online sample. Using the Uses and Gratification

approach, getting social connectedness is found as a critical predictor of more frequent use and sharing. We then consider the heterogeneity of music group participants and further validate the meanings conveyed in technology use. Then follows a synthesis in which survey findings with regard to motivations, group membership and user identifications are interpreted and contextualised alongside the qualitative results from Chapter 3. Chapter 4 closes by considering these findings in light of ageing, and by challenging the "myths of ageing" with the data that we have got.

The two central chapters of this dissertation address different aspects of meaningful participation in community music among late middle-aged and older people. Having conceptualised 'meaningful participation' of community music and the roles of technology in sustaining the development of music practices (Chapter 3), Chapter 4 focusses on the psychological basis of these practices and technology use in term of self-efficacy and motivations with a set of exemplars of technology – digital music technologies. In Chapter 5 which concludes the dissertation as a whole, we revisit the research questions, summarise the interlinked key findings for each question, and elaborate on how we contribute to narrowing the gap in knowledge concerning active ageing and technology use. As such, we share the views that technology use and people's everyday practices are not mutually exclusive (Dourish, 2006), and that practices cannot exist and persist without the successive enactment of the linkages among people, technological stuff, competences, and meanings (Shove, 2007; Shove et al., 2012).

Chapter 2 Literature Review

2.1 Active Ageing and Related "Positive" Concepts of Ageing

> "Active ageing is the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age". (World Health Organisation, 2002, p. 12)

The notion of active ageing first emerged in the 1990s and became prominent as a policy framework in a report of World Health Organisation (2002). Active ageing is proposed to address the worldwide issue of population ageing and its implications for pensions, public health, social care, employment, and political systems (Stenner et al., 2011). The concept of active ageing in the literature is complex and multi-dimensional. "Active" refers to the continuing participation in society, so as to remain physically active and maintain self-efficacy, autonomy, and independence (Bowling, 2008). Apart from policy concerns, the notion of active ageing also encompasses scientific concerns that are explanatory and descriptive (e.g., by depicting personal, physical, social, and psychological determinants) (Stenner et al., 2011; World Health Organisation, 2002). In the policy proposal, there are three "pillars" of active ageing that policymakers and practitioners can draw upon: health, participation, and security. The "pillar" of health is concerned with physical health, mental health and functioning, psychological well-being, sense of control, self-efficacy, and self-mastery. The "pillar" of *participation*, as mentioned in section 1.2, entails the optimisation of activities in relation to many societal domains such as workforce, politics, education, arts, and religion (Stenner et al., 2011). The third "pillar", security, emphasises that activities should provide protection, dignity, and care, to address social, financial and physical security needs and rights of people (World Health Organisation, 2002). The role of family and

community is stressed alongside security. Alan Walker, a strong advocate of active ageing policies, argues that the essence of active ageing is the understanding of "activity", participation, and inclusion of older people (Walker, 2002).

To make sense of active ageing, it is essential to write about its connection to other related "positive" terms of ageing that have been developed to challenge the overfocus on negative stereotypes and deficits in old age (Fernández-Ballesteros, 2008; Vines et al., 2015): successful ageing, healthy ageing, positive ageing, etc. "Successful ageing" and "positive ageing" are often used interchangeably in literature (i.e., Bowling, 1993). What all these concepts (including active ageing) have in common is that ageing is conceptualised and viewed from positive and optimal perspectives rather than from the "decline and loss paradigm"(Holstein & Minkler, 2007). Among these concepts, successful ageing has received extensive attention in the psychology and social literatures in the past three decades, whereas the popularity of active ageing is rising quickly in the last decade (Fernández-Ballesteros, 2008), as well as in connected fields, such as HCI[10]. Health benefits in the active ageing literature overlap with the conceptualisation of successful ageing, in terms of the biomedical (e.g., physical health, mental health, and quality of life) and psychosocial (e.g., psychological well-being, life satisfaction, and control) perspective (Bernstein, Marcus, Karger, & Miller, 2010). However, a more nuanced study by Bowling (2008) shows that health and functioning in the successful ageing literature "focus on the existence of a state", while the active ageing literature emphasises "actively maintaining" these desired statuses and portrays these statuses in successful ageing as "end-points". Following this strand of thought, we briefly review successful ageing and active ageing and justify why an angle of active ageing is essential for answering the research questions proposed in this dissertation.

Successful ageing, according to one of the most widely used models developed by Rowe and Kahn (1997), refers to (i) the absence of disease, disability, and risk factors, (ii) the maintenance of physical and mental health and functioning, and (iii) active engagement in

[10] Out of curiosity we conducted a similar literature search with the ACM Digital Library and found that during 2009-2018 ACM Digital Library yield 20 publications with "active ageing", while had only 7 publications with "successful ageing".

society. Early studies of successful ageing focus on conceptualising the criteria of the "successful" status (e.g., Day, 1991; Fries, 1990), whilst these criteria are often used as outcomes in the psychological, process-based models (e.g., Baltes and Baltes' selection-optimisation-compensation model) in more recent studies. Process-based models of successful ageing attempt to unpack the process of ageing in terms of people's coping strategies, sense of control or self-efficacy, as well as goals and self-worth. For example, Baltes and Baltes (1990) contend that an older adult can select and concentrate on those life domains that are congruent with his/her motivations (e.g., preferring maintaining long-term relationship to making new friends), goals (Carstensen, 1995; Carstensen, Isaacowitz, & Charles, 1999), and environmental situations, so that he/she can remain "successfully old" even though the biological limitations cannot be ignored (Baltes & Carstensen, 1996). However, it should be noted that models of successful ageing are contentious (Bowling & Iliffe, 2006): models in this field have been criticised for the lack of clarity in the definition of "success" and the way they ignore individual ambitions and life trajectories (Vines et al., 2015). One strand of critics argues that the notion of "success" may imply a moral and value judgement on the importance of staying engaged in later life, and those who do not have the financial capability or physical health are to be blamed for being "unsuccessful" (Lazar, Diaz, Brewer, Kim, & Piper, 2017; Rozanova, 2010), or even being excluded. From a critical gerontology viewpoint, the lay definition of "success" is as important as the theoretical definitions that have been extensively reported in the literature (Bowling, 1993; Bowling & Iliffe, 2006; Rowe & Kahn, 1997). This line of research highlights that lay models (or models that combine lay and theoretical definitions) work better than purely theoretical ones in defining and measuring "success" (Bowling & Iliffe, 2006). Also, the theoretical definitions of "success" (e.g., physical and mental health and functioning) are not accurate and nuanced enough to cover values that older people care about, such as "social bonds and worth" (as cited in Vines et al., 2015). As such, the critiques of successful ageing also apply to the active ageing literature (Holstein & Minkler, 2007).

Extending the successful ageing literature and the importance of "lay definitions", more recent studies on active ageing have agreed on the fact that older adults are able to make active contributions to their health and well-being (Stenner et al., 2011), and call for research

focusing on how older people themselves perceive active ageing (Bowling, 2008; Clarke & Warren, 2007). The contemporary usage of the term "active ageing" entails the inclusion of frail and disabled older people, as well as the "*vital connection between activity and health*" (Clarke & Warren, 2007). As such, the framework of active ageing addresses the biased tendency underlying "successful ageing" and the potential risk of sacrificing specificities of the various lived experiences of older people in research and policy (Holstein & Minkler, 2007; Stenner et al., 2011; Walker, 2002). Foster and Walker (2015) suggest that active ageing presents a more holistic approach than successful ageing, and has a more comprehensive focus on societal responsibilities, rather than emphasising individual responsibilities only (Rozanova, 2010). For example, with a series of biographical interviews, Clarke and Warren (2007) argue that older people's fear and hopes for the future exist alongside the positive anticipation of future events and intergenerational relations. What is unique in later life, according to Clarke and Warren (2007), is that older people strive for the accomplishment of everyday activities and needs (e.g., "living for now", "taking a day at a time") instead of achieving ambitious goals. Their findings, on the one hand, imply the importance of attending to the subtler understanding (Clarke & Warren, 2007) and subjective meanings (Stenner et al., 2011) of activity and active ageing. On the other, their work, in line with other active ageing literature (Bowling, 2008; Stenner et al., 2011), highlights the prevalence of the forward-facing perceptions in older age through participation in ordinary activities. These implications support our attempt to investigate community music in support of active ageing.

How should research be specific about the subtleties and subjective meanings of active ageing? One way is to contribute to the understanding of "*how and why do older people experience old age in their particular ways*" (Holstein & Minkler, 2007). One line of research (i.e., Stenner et al., 2011) challenges the pervasiveness of the "cause-effect" approach (e.g., what determinants influence health and well-being) in the successful ageing literature (and some active ageing literature and policy frameworks as well, e.g., the WHO policy framework of active ageing), and argues that active ageing frameworks should be supplemented by a "challenge and response" approach. The "challenge and response" approach focusses on how challenges in later life might influence individual's capacity of

keeping active, and how individuals might respond to these challenges (Stenner et al., 2011). Research using the "challenge and response" approach underlines the existence of the on-going tension between "active aspiration" and objective circumstances. Instead of measuring active ageing with top-down, objective measures, this approach is more appropriate in answering the "why" and "how" questions by attending to the heterogeneity of the older population. For instance, Yap and Kapitan (2017) argue that how older people perceive and evaluate events, which derive from their motives and efficacy in the face of managing these later life events (e.g., retirement), is essential to understand their coping strategies. This angle is also well situated in this dissertation's scope: the encounters with new[11] technologies may challenge people's routine activities and everyday life. Also, how older people respond to circumstances brought by these technologies in their particular ways are closely tied to the focus of this dissertation. We then review the literature on the uptake of new technologies by older people later in this chapter (see section 2.4).

In sum, active ageing is an essential but yet under-analysed concept (compared to successful ageing). It is more holistic than successful ageing in terms of its inclusion of frailer older people and the emphasis on the vital connection between participation and health. Past research has agreed on the fact that older people are able to actively participate in their everyday activities to maintain well-being. However, it is still unclear why and how older people experience old age and keep healthy and active lives in their particular ways, especially when new circumstances occur, such as the emergence of new technologies and the changes in practices and social relationships. It is not clear either what role technology plays and what role older people play in striving for active ageing. Research that acknowledges the importance of subjective meanings and the subtleties of active ageing can contribute to this gap, but is still in its infancy (Bowling, 2008). As such, we unpack elders' experiences and active ageing in three themes: (i) understanding social *participation* in relation to active ageing; (ii) understanding *the psychological significance* of participation in pursuit of active ageing, and in particular, identity development; (iii) understanding the role

[11] See Chapter 1 for how we use "new technologies" in this work. "New technology" refers to technology that is relatively new to our late middle-aged and older participants rather than immediate technological innovations.

of *technology* in people's active maintenance of active ageing. After that, we will review technology adoption and the psychological significance of motivation and self-efficacy from the HCI and technological perspective.

2.2 Active Ageing and Psychological Well-being: Participation Matters

Studying participation in community activities has been an important area of ageing research. Literature concerning participation and old age has been closely tied to activities, social roles, health, and well-being (Sugarhood, Eakin, & Summerfield-Mann, 2017). An early attempt of this body of work is Havighurst's activity theory (Havighurst, 1963), depicting that well-being of older adults is enhanced by (i) higher levels of participation in social and collective activities; (ii) new roles that replace the relinquished roles. In this section, the following themes around social participation are reviewed: the benefits of social participation, the types of social participation, and how social participation is experienced.

2.2.1 Benefits of social participation

Although a plethora of research has discussed the linkage between social participation and well-being among older adults, the linkage is not easy to untangle (Adams, Leibbrandt, & Moon, 2011). Participation in social activities, health, well-being and life satisfaction are interdependent in a sophisticated manner (Adams et al., 2011). From a general viewpoint, as Berkman et al.'s (2000) ecological model of ageing suggests, social and collective activities (mezzo-level) function as "social institutions" (Jahoda, 1982) that provide opportunities for various psychological mechanisms (micro level) to take place, which further impact individual's health and well-being through a variety of health, psychological, and physiological pathways (see Figure 2-1). The psychological mechanisms in Berkman et al.'s conceptual model embrace social support (Stephens, Alpass, Towers, & Stevenson, 2011), the establishment and reinforcement of social bonds (Poortinga, 2006), social influence (Berkman, Glass, Brissette, & Seeman, 2000), interpersonal contact and socialisation

(Cornwell, Laumann, & Schumm, 2008; Morrow-Howell & Gehlert, 2012), and the maintenance of social and psychological resources (e.g., social cohesion) that function as "buffer zones" between psychological stress and well-being (Cramm, Dijk, M, & Nieboer, 2013). These psychological mechanisms further have an impact on health and well-being via a range of psychological pathways proximate to health outcomes, such as self-efficacy and competence (e.g., agentic capacity in Stenner et al., 2011), coping effectiveness in terms of health changes (Bukov, Maas, & Lampert, 2002; Ouwehand, de Ridder, & Bensing, 2007). Researchers also note that it may be that the relationship between participation and well-being is reciprocal in nature, and in some cases, a stronger causal relationship of well-being influencing participation than of participation influencing well-being is found (e.g., Janke, Nimrod, & Kleiber, 2008). As such, it should be noted that the complex relationship between social participation and well-being should be carefully interpreted by considering the macro-level, social-structural contexts, types of activities, and mediating factors (e.g., value, meaning of participation, and the degree of choice) (see a review by Adams et al., 2011). We proceed to review the impact of different types of social participation in the following section.

2.2.2 Types of social participation

The ageing literature on the linkage of active participation and well-being has been advanced by the recognised necessity of considering different types (e.g., goals, content, context) of activities and individual factors in relation to participation, as all activities are not equally valued by all older adults (Adams et al., 2011). In contrast to solitary activities that an individual does alone (e.g., reading, listening to music), social participation is roughly categorised as *informal* (e.g., activities with family, friends, or neighbours) and *formal* (e.g., participation in a formal group, being a member of a club, political activity, and volunteering work) (Adams et al., 2011). Unlike informal activities, formal participation always entails an explicit purpose and collective actions with certain levels of commitment (Buffel et al., 2014). However, the broad category of social participation is insufficient in accounting for the variations of participation, and the literature suggests that combining two or more dimensions of activity improves the accuracy of measurement (Adams et al., 2011).

2.2 Active Ageing and Psychological Well-being: Participation Matters

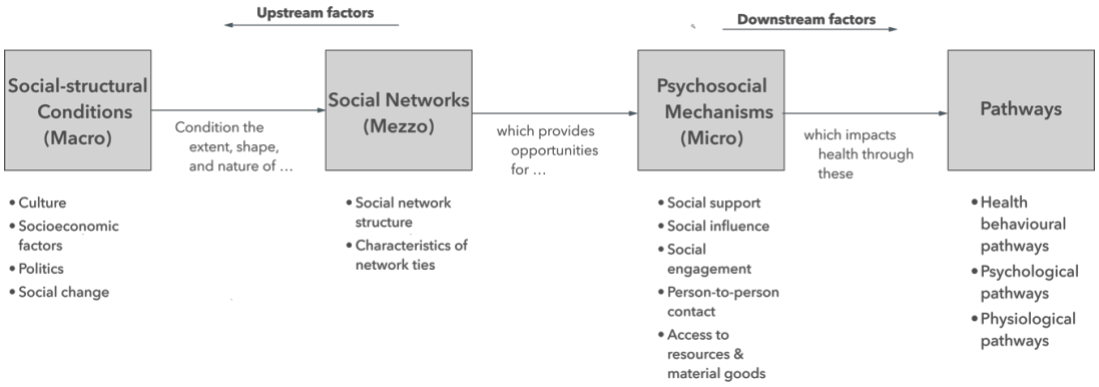

Figure 2-1 Reproduced Berkman's conceptual framework of how social networks impact health (Berkman et al., 2000)

Prior literature suggests that older people participate in more than one type of social activities (e.g., Adams et al., 2011). Some argue that the quality of activities is no less important than the quantity and range of activities (i.e., Gibson, 1987). How and why do people select from the many types of social participation? Bukov et al. (2002) define social participation in terms of the socially-oriented sharing of resources and classify social participation into three types in terms of the content, context, and the intensity of resources: collective participation, productive participation, and political participation. Bukov et al. (2002) argue that there is a hierarchical, *accumulative* relationship among the three types of social participation. Collective participation, such as informal and leisure activities, is most common and requires the least social resources. People merely need to devote time to collective participation. Productive participation refers to activities that require specialised skills to produce goods, services, or benefits to others. Political participation is the most intensive participation and warrants the most demanding level of social resources such as "social knowledge and social competence" (as cited in Bukov et al., 2002). Accordingly, older people who perform more demanding social participation (e.g., political participation) can participate in less demanding participation (e.g., collective and productive participation) as well (e.g., partially supported by Serrat, Villar, & Celdrán, 2015). The *cumulative* nature of social participation is the supplement to the *selection* hypothesis of ageing (e.g., Carstensen's socioemotional selectivity theory, Baltes and Baltes' selection-optimisation-compensation model). As Bukov et al. (2002) put it, selection takes place among less-demanding activities.

2.2.3 Experiences of social participation

Another line of research is concerned with how older adults experience social participation, and in specific, how *values* and *meanings* are enacted through participation. Instead of unpacking social participation from objective dimensions and categorisations (e.g., physical, cultural, productive, leisure), this body of work put individuals' values and motivations at the core of participation (e.g., Lazar & Nguyen, 2017; Sugarhood et al., 2017), and argues that the understanding of values can guide policy making and the practice of active ageing (Walker, 2002). Sugarhood et al. (2017) conceptualise social participation as an adaptive process, in which values (e.g., connectedness, autonomy, affirmation, maintaining self-identity) are enacted, and actions and choices are guided by the enacted values. The values are in turn reflected and re-enacted in the experiences of participation. Moreover, the understanding of the *meaning* of social participation is among the least addressed elements of social participation (Adams et al., 2011), though it is regarded as one of the crucial mediating factors in the linkage of participation and well-being. Back to our focus on community music and ageing, the experiences, *values*, and *meanings* of participation in leisure activities (in particular, artistic and community music activities) in later life are then reviewed.

The concept of leisure is prominent in the reported activities among older people in pursuit of health and well-being (Warner, Doble, & Hutchinson, 2012). Stebbins (2008) defines leisure activity as "*uncoerced activity engaged in during free time…in a satisfying or a fulfilling way, using their abilities and resources to succeed*" (p.336). Leisure activities are beneficial for elders' subjective well-being in terms of a sense of autonomy, enjoyment, the maintenance of social connection, and meaning-making in later life (Alm et al., 2009; Ihle et al., 2017; Lazar & Nguyen, 2017; Newman, Tay, & Diener, 2014). When considering the content and context of social participation (see section 2.2.2), leisure participation is complex and dynamic: it encompasses the cognitive and physical processes of learning, emotional responses alongside the content of activities, as well as the perceived value and benefits from social interaction (Cheek & Piercy, 2004; Liddle, Parkinson, & Sibbritt, 2013). Consequently, a variety of psychological mechanisms and pathways play a role in the linkage between art participation and well-being. For example, researchers find that participating in a dance class

improves older people's physical strength, provides social support, strengthens their self-efficacy (Pargament & Cummings, 2010), and contributes to their resilience in later life. Resilience, from a psychological and emotional perspective, is defined as the capacity to maintain or regain psychological well-being in the face of challenges (Lavretsky, 2014). Another study on older women's art and crafts work highlights that crafting provides potential access to a sense of meaningfulness and purposefulness, and helps structure older women's later lives (Liddle et al., 2013). In line with the accumulative nature of social participation in Bukov et al.'s (2007), although not explicitly, Liddle et al. (2013) argue that control can be understood as "emerging competencies inherent", which can potentially be generalised to relevant areas beyond arts activities. However, these studies only draw hypothetical conclusions on the generalisability of experiences with arts and leisure activities. We then move to community music participation.

A growing body of research has demonstrated the benefits and barriers of active music engagement for the elderly (Creech, Varvarigou, Hallam, et al., 2014; Hallam, Creech, Varvarigou, & McQueen, 2012b), as well as the strategies to encourage them to get involved in these activities (Hallam, Creech, Varvarigou, & McQueen, 2012a; Hallam et al., 2012b). This line of work is built upon the bulk of empirical evidence on the association between communal music participation and psychological, physical and social well-being (see a review by Croom, 2015). In the case of community music, participating in communal music activities is found to be associated with improved subjective well-being (Hallam, 2010; Hallam et al., 2012a; Hallam et al., 2012b). Bailey and Davidson (2002) conceptualise group singing as adaptive, and identify four categories of benefits proximate to health benefits: clinical-type benefits, audience-choir reciprocity, benefits associated with group process, and benefits in relation to mental engagement. In a study with older people participating in community music, Creech, Varvarigou, Hallam, et al. (2014) identify critical practices of community music (i.e., scaffolding, modelling, giving and receiving feedback) that facilitate identity navigation and reinforce interpersonal relationships. Positive psychology literature, although still under debate, has been arguing that "experiencing life as meaningful" is a significant component of psychological well-being (de Muijnck, 2013; Seligman, 2012). To this end, the consideration of the *meanings* of participation provides a lens, through which we

could draw a nuanced picture of active music participation and its connection to psychological well-being.

Taken together, social participation, one of the core elements of active ageing (WHO, 2002), is associated with health and well-being benefits via a range of psychological mechanisms and pathways. Though the successful ageing literature provides insights on how people make decisions in participating in different social activities, it is still unclear how participation is maintained, and how the maintenance of participation enhances well-being – the kernel of participation and active ageing (Adams et al., 2011). As such, a more nuanced understanding and theoretical reasoning with respect to individual experiences, motivations, and meanings of social participation is needed. One way of addressing this gap of knowledge is to investigate the subtleties of participation via the lens of identity and identification (i.e., musical possible selves in Creech, Varvarigou, Hallam, et al., 2014). We then proceed to unpack the psychological significance of participation through the lens of identity development in old age.

2.3 The Psychological Significance of Participation: Identity Development Matters

A plethora of research has shown that social activities (including arts and music activities) provide people with ways of understanding the purposes and meanings of their lives (Csikszentmihalyi, 2013; Seligman, 2012) and help them develop their self-identity (e.g., Crescioni & Baumeister, 2013; Hays & Minichiello, 2005). In the context of communal music activities, people not only use music as a "symbol" to define their self-identities (Hays, 2005), but also experience a sense of belonging and connection to like-minded others through participation (e.g., Hallam et al., 2012a; Packer & Ballantyne, 2011). Also, people obtain essential material and psychological resources (DeNora, 2000) that further support their defining, changing, developing, and constituting of self-identity and social identities (see a review by Croom, 2015). Then we ask, how is identity, or more precisely, social or collective identity, constructed through active participation?

2.3.1 Identity development in community participation

The social identity tradition (Tajfel & Turner, 1979, 2004; Turner et al., 1987) provides a theoretical framework to understand how one's knowledge of belonging to social groups is associated with the "positively valued distinctiveness" of their ingroups members (Abrams & Hogg, 2006, p. vii), and how one's social identification forms through participation in these social groups (also termed as group behaviour generally in self-categorisation theory; Turner et al., 1987). In other words, the social identity perspective embraces two broad categories of sub-theories: *social identity theory* (of the intergroup behaviour, more precisely) by Tajfel & Turner (1979), and *self-categorisation theory* by Turner et al. (1987), which is specifically about the cognitive process in which people perceive the social world, identify themselves with groups, and manifest group behaviours (Hogg & Reid, 2006). Drawing upon literature using the *social identity approach*, we unpack identity development in older people's participation in communal music.

The social identity perspective suggests that the formation of social identity through participation is a psychological process, and the social groups that render the common social identity of their members are actually "psychological crowds" (in contrast to random crowds at an airport or a local market) (e.g., Neville & Reicher, 2011). The shared identity (a term used by Khan et al. 2016) is essentially "a sense of community" (see McMillan & Chavis, 1986), which is not merely a sense of belonging to a broad category (e.g., "we are older people", or "we are American"), but is also the identification that is fed back by participation (Khan et al., 2016). There are two core concepts relevant here within the social identity perspective: multiple self and variable self. Multiple self implies that the self is "*a complex system operating at different levels of abstraction*" (Reicher & Hopkins, 2016). A straightforward interpretation of multiple self is that we belong to many different social groups, therefore have multiple identities that affect our psychological functioning in different ways (Reicher & Hopkins, 2016). Variable self is concerned with the cognitive process of who we are, how we think of ourselves in different ways in terms of our relations to others and in different contexts (e.g., group membership), and how we function together as a group (also known as group behaviour) (Tajfel, 2010). The *self-categorisation theory*

focusses on unpacking group behaviours that are driven by the "consensual stereotypes", and more specifically, on investigating how group behaviours impact the psychological field of individuals through the cognitive process of variable self (Reicher & Hopkins, 2016). In the social identity and self-categorisation literature, there are two routes through which social identity is formed and enacted: a *cognitive* route in the self-categorisation theory, and a *relational* route.

The *cognitive* route of identity development resonates with Goffman's (1959) theorisation, that identity is constructed based on rules and norms that people are engaged in. The cognitive route of identity development suggests that social group members who share common identities experience a shift toward intimacy with their in-group members (Reicher, 2011). A shared understanding of the norms and cultures of the groups further enables senses of cooperation, trust, mutual support, and respect (as cited in Khan et al., 2016). Given that social identification with groups structures people's perception and action (see Reicher & Hopkins, 2016), the senses of trust, mutual support, cooperation, and respect further facilitates the coaction and the actualisation of shared goals of social groups. In this respect, the social group is "*a space in which members are able to enact their identities"* (Reicher & Haslam, 2006; see also Khan et al., 2016; Hopkins, Reicher, Khan, Tewari, Srinivasan, & Stevenson, 2016). This process is termed as collective self-realisation (CSR) (see Hopkins et al., 2016), which is associated with positive experiences of social participation and large-scale collective actions (Drury, Cocking, Beale, Hanson, & Rapley, 2005; Drury & Reicher, 2005, 2009). The self-categorisation perspective provides a conceptual framework to understand how identity is formulated and enacted through participation and implies that group membership is more than just perception. Instead, group membership, according to Reicher and Hopkins (2016), is closely tied to action, sometimes undetermined, through which we make sense of how others see us and how others allow us to see.

The *relational* route suggests that people develop a sense of connection with others by participating in social groups, which further enhances the mutual intimacy between group members (see Hopkins et al., 2016). Consequently, group members become more comfortable with the connectedness with ingroup members and experience a sense of

acceptance and recognition. Such recognition of shared group membership increases the extent to which people provide mutual support to each other (Levine, Prosser, Evans, & Reicher, 2005). Also, the more trustworthy and helpful connection contributes to a higher level of perceived social support (e.g., Haslam, O'brien, Jetten, Vormedal, & Penna, 2005), which impacts individuals' resilience in the face of life changes and psychological stressors in old age. This resonates with the psychological benefits of social participation that we have reviewed in section 2.2.1.

It should be noted that both routes may exist in parallel, and the social psychology research on either way of identity development is still developing (see Hopkins et al., 2016). Moreover, identity development is not a longitudinal process. Instead, social identities can be enacted and strengthened in a retrospective manner after participation (see Khan et al., 2016). Shared social identity may contribute to emotional intensity in a spiralling way (Hopkins et al., 2016), and further prompt a sense of community and the recognition of group norms.

Thus far we have been writing about the construction and development of social identity through participation and implying that the process of identity development is forward-facing. A related concept with respect to the future-facing identity development to be introduced in this section is *possible selves*. It is essential to add this concept because (i) possible selves function as the incentives for future behaviours, which resonates with the future-facing social identification process; and (ii) possible selves convey an "evaluative and interpretive" context of self-concept (Markus & Nurius, 1986). The concept of possible selves links cognition and motivation of the sense of self, and is defined as "*individual's ideas of what they might become, what they would like to become, and they are afraid of becoming*" (Markus & Nurius, 1986, p. 954). In other words, possible selves is a range of hypothetical self-schemas about one's aspiration, hope, fear and fantasies (see Schouten, 1991). Self-schema is defined based on self-concept – a concept without a complete agreement in literature but is about a set of cognitive and affective understanding about the self (see also Schouten, 1991). When self-concept is viewed as "*a system of affective-cognitive structures about the self that lends structure and coherence to the individual's self-relevant experiences*", it is termed as self-schema as well (Markus & Nurius, 1986, p. 955).

2.3 The Psychological Significance of Participation: Identity Development Matters

The antecedents of possible selves encompass representations from the past (also called past selves) and in the future (also called future selves) (Markus & Nurius, 1986). Consequently, possible selves influence one's strategy of approaching or avoiding goals (Markus & Nurius, 1986; Markus & Wurf, 1987). To this end, possible selves provide a range of conceptual frameworks to make sense of the past selves, but also provide the "means-ends patterns"[12] for future behaviour (Markus & Nurius, 1986). Perceived *attainability* and *desirability* determine the motivating power of possible selves (in this dissertation we term both *attainability* and *desirability* under the broader category of *evaluation*). *Desirability* is the extent to which an individual wants to achieve the hypothetical self-schema. Perceived *attainability* of possible selves refers to how confident an individual is in approaching the hypothetical self-schema. In more complex cases, possible selves encompass both positive and negative aspects. Schouten (1991) suggests that such situations engender "approach-avoidance conflicts" (see Lewin, 1935) and require further elaboration of the self. It has been suggested that the better elaborated, more desirable, and more attainable possible selves, the higher motivating power they have (Schouten, 1991). It should be noted that possible selves are not constrained within the self. Instead, it is closely tied to the social and cultural contexts (e.g., many forms of possible selves derive from social comparison or self-categorisation, see Markus & Nurius 1986).

Taken together, the conceptualisation of possible selves functions as the bridge between the past, present and future selves, directly connects motives and associated actions by being carriers or representations of incentives of competence, and further contributes to wellbeing by rendering a sense of agency among people. For example, a study carried out by Porter et al. (as cited in Markus & Nurius, 1986) among victims of a life crisis shows that the good recovery subjects (those who reported that they were recovering well, even if they were not) report more positive possible selves and think it possible for them to be better than poor recovery subjects. Likewise, recent studies show that the elaborated, desired, and attainable

[12] Markus and Nurius (1986) further elaborate on "means-ends patterns": "individual's self-knowledge of what is possible for them to achieve id motivation as it is particularised and individualised, it serves to frame behaviour, and to guide its course." (p.955)

possible selves contribute to adult development (including in later life) positively (e.g., Frazier, Gonzalez, Kafka, & Johnson, 2002; King & Hicks, 2007).

2.3.2 Identity development in music participation

Given that music is regarded as a symbol of identity-expression and the medium for building social relationships, we then unpack identity development particularly in relation to music in later life. Similar to the notion of the shrinking social network in old age in some successful ageing literature, the range of music tastes has been found to narrow down as people age (Harrison & Ryan, 2010). From the personal level, personality psychologists have been using music preferences as the indicators of personality change across age (Bonneville-Roussy, Rentfrow, Xu, & Potter, 2013), and find that extrinsic factors (e.g., individual differences, social relation) and intrinsic factors (e.g., structure, perception of music) explain the age trend of music preference (Bonneville-Roussy, Stillwell, Kosinski, & Rust, 2017). Besides, the expressiveness, consumption, and exhibition of music have been recognised as ways of "*signalling group membership, social location, and identity*" (Harrison & Ryan, 2010). In a study of singers' self-identities, researchers find that the sense of self of singers is intrinsically connected to individual's vocal, expressive capacity and "*their own embodiment of sound as agent of selfhood*" (O'Bryan, 2015). Factors such as innovativeness and self-efficacy may influence the formation of music identity (Krause & North, 2014).

From the social perspective, Pearce, Launay, and Dunbar (2015) posit an interesting explanation of the role of music in generating cohesion in groups from the perspective of evolutionary adaptation. They argue that singing, as well as other musical activities, has an ice-breaker effect on social bonding. Although the impacts on social bonding do not differ between music-mediated groups and non-music groups, music has a quicker cohesion effect. This ice-breaker effect has been supported by psychophysiological, neurological and subjective evidence. For example, research on synchronous activities shows that singing is associated with an improved level of well-being and the perception of social bonding, which is linked to an increased level of oxytocin and β-endorphin (Dunbar et al., 2016; Grape, Sandgren, Hansson, Ericson, & Theorell, 2002; Tarr, Launay, & Dunbar, 2014). Also,

researchers in music education also find subjective evidence in support of the linkage between group singing and well-being (Creech, Hallam, Varvarigou, Gaunt, et al., 2014; Hallam, 2010; Hallam et al., 2012b). Taken together, active participation in the forms of group singing and other musical activities enhances cognitive, emotional and social well-being (Creech, Hallam, McQueen, & Varvarigou, 2013). To this end, the positive effects of active music making find some space in the active ageing and social participation literature.

Musical possible selves, in particular, is essential in enhancing psychological well-being in later life. From a series of case studies in the UK, Creech, Hallam, Varvarigou, Gaunt, et al. (2014) identify musical possible selves among older people through group music-making, and suggest that musical possible selves may contribute to subjective well-being by helping older people navigate the process of ageing, rendering enhanced senses of autonomy, purpose, and social affirmation. The positive effects on psychological well-being in terms of musical possible selves have also been found in other arts and music activities (e.g., Wakeling & Clark, 2015).

Although the angle of identity development helps advance research into the meanings of active participation in later life, it is still unclear how experiences, values, meanings, and motivations of active music participation are represented and communicated within the system of self in old age, and in what way they develop with music practices during participation. A better understanding of social participation in community music and how older people play an active role in it via the lens of identity development is needed.

2.4 Active Ageing and Social Participation in HCI: Technology Matters

Besides group music-making (in specific group singing in this dissertation's context), another important aspect of active music participation comes from the fact that music possessions and technological devices (e.g., traditional music listening devices and new technological tools such as the streaming services and cloud storage technologies) that people *have* is contingent on what they *do* (see Shove, 2007). According to a recent report from Pew Research Centre

(2017), those who are aged 65 and older, as with other age groups, are moving towards digitally connected lives in terms of smartphone ownership, access to the Internet, and social media use. Moreover, community music practitioners have begun to explore opportunities enabled by new technologies (e.g., streaming services, cloud technologies) to sustain their routine music practices (Doebele, 2012). In spite of the increasing technology use in the last five years[13] and the positive viewpoint towards technology among the elderly, barriers of use and the need for help still exist (Pew Research Centre, 2017). Also, HCI researchers, for example, Durrant et al. (2017), note that technology use in old age has a potential impact on the construction of "sense of self", identities and subjective well-being. Motivated by the evidence and inspired by the balance between "having" and "doing" (Shove, 2007), we propose that the challenges (coupled with opportunities, of course) brought by new technologies to active music participation and how older people respond to new circumstances in pursuit of active ageing cannot be ignored in the enquiry of this dissertation. To this end, we then unpack social participation and active ageing from the HCI perspective.

In this dissertation, we adopt Lucy Suchman's notion of "situated action" in the context of Human-Computer Interaction (HCI), so as to understand the role that technology plays in social participation in the context of active ageing. A central tenet of "situated action"[14], understood in the context of HCI, is that "*every course of action depends in essential ways on its material and social circumstances*" (Suchman, 2007, p. 70). This line of work reconstructs technology use as situated, social practices: "*technologies are constituted through and inseparable from the specifically situated practices of their use*" (Suchman, Blomberg, Orr, & Trigg, 1999). Suchman et al. (1999) suggest a "situated action" approach to study the role of ICTs in everyday life by reconfiguring space and time, so as to make necessary elements of practices available. This perspective sheds light on the subtleties of social participation in community music and the mundane nature of daily routines in later life (see also Comber,

[13] 2000-2016 in the report from Pew Research Centre.
[14] In saying that we adopted Suchman's notion of "situated action", we have to note that it is beyond the scope of this dissertation to include an in-depth, critical discussion around key concepts in the theory of situated action (i.e., plans, actions, see more for a debate around this: Suchman, 1993; Vera & Simon, 1993), nor is it necessary to answer my research questions proposed in this dissertation.

Hoonhout, van Halteren, Moynihan, & Olivier, 2013). Specifically, we intend to depict who participate, how, where and when they attend, the values and meanings that are bound up with participation and active ageing, as well as the contexts in which *doing* (i.e., the accomplishment of community music practices) occurs.

Another relevant line of thought is Elizabeth Shove's theory of social practice (Shove, 2007; Shove et al., 2012), which is gaining popularity in HCI with regard to the management of digital possessions (e.g., Lindley & Wallace, 2015; Odom, 2014) and everyday practices (e.g., Comber et al., 2013). As mentioned in Chapter 1, practices, in the context of social practice theory, can be viewed as a set of constitutive elements: things, competences, and meanings. According to Shove et al. (2012), the linkages between elements are as important as the elements themselves – "*practices emerge, persist, and disappear as links between their defining elements are made and broken*" (p. 21). This dissertation builds on this idea and focusses on analysing the development of linkages when unpacking community music participation. Shove's theory is adopted insofar as a conceptual framework – it is both substantial, by covering the subtleties of participation, and comprehensive, by connecting related lines of enquiry. As Shove (2007) suggests, the elemental framework of social practice can address the challenge of bringing traditionally separate strands of research together by showing how elements are linked and how practices evolve and intersect. However, we feel it necessary to give readers[15] an overview of concepts that are used later in the analysis and discussion of empirical findings:

- **Practice** – practices consist of inter-connected elements including materials, competences, and meanings. *Materials* include both human actors and non-human actors (we refer to them as things and people in this dissertation). *Competences* refer to practical knowledge, know-how and confidences of doing; competences are distributed between people and things, as well as people and people (Shove, 2007). *Meanings* refer to motivations and values in relation to practices.

[15] Especially for those unfamiliar with the social practice theory

- **Performance** – the concept of "performance" (which is different from "performance" in music) comes from Shove et al. (2012)'s terminology of two forms of practices: practice-as-performance and practice-as-entity. Practice-as-performance refers to the immediacy of doing, meaning that a practice-as-performance may be different each time. In contrast, a practice-as-entity "*has a relatively enduring existence across actual and potential performances*" (Shove et al., 2012, p. 13) and endures over time and space. Practice-as-performance and practice-as-entity are closely related, in a way that performances are "*shaped by and constitutive of complex relations"* of elements and *"comprise the practice-as-entity*" (Shove et al., 2012, p. 13).
- **Career** – refers to the time dimension of practices, as practice-as-entity endure over time and space. Shove (2007) notes that practices cannot exist without successive performances and people (so-called "practitioners" in Shove' work) who perform them. *Careers* apply to both people and practices. As Shove (2007) notes, "*practitioners' careers, formed of many instances of performance, combine to define the career of a practice-as-entity*" (p. 146). Also, practitioners can be recruited into practices, and develop from a novice to a committed member (Shove et al., 2012).
- **Reproduction of practices** – constellations of elements form practices-as-entity, which are reproduced (and transformed) when new elements (e.g., new things) are integrated into "*what are of necessity somewhat new performances, so they are of consequence for the constitution and emergence of new practices*" (Shove, 2007; p. 148).

In the sections that follow we expand on HCI empirical research that (i) has begun to examine the situated use of technology in relation to active participation and ageing, and (ii) around music-related technologies specifically. After that, we further review research concerning technology adoption, and elaborate on the psychological basis of motivation and self-efficacy on technology use.

2.4.1 Active participation among older people in HCI

We reviewed empirical articles published in the ACM SIGCHI venues[16] in relation to ageing and active participation over the past five years[17]. Inspired by the discourse analysis and critical review of Vines et al. (2015), search terms that were used include *ageing, older adults, seniors, later life, elderly, older people, retiree, retired, elders, geriatric, life community, hobby, interest, daily practice, everyday life, life course, retirement, grandparent, social activities*. The initial search returned 136 records. We then screened the full texts of all the articles using the following criteria:

(1) Included work should be full paper.
(2) Included work should contain empirical research data (reviews, theoretical inferences are not included);
(3) Included work should focus on or include any social participation and everyday practices around ageing (studies on assistive technologies, patient-care interaction and remote communication with family are not included).

As a result, 39 articles are included for thorough review in terms of the following aspects: type of activity/participation, discourse of ageing, types and roles of technologies, as well as key findings in relation to older participants' competences and meanings embedded in their participation and use of technology (see Table 2-1). Unsurprisingly, only two articles on dementia care are concerned with music-related activities (Lazar, Edasis, & Piper, 2017; Morrissey, Wood, Green, Pantidi, & McCarthy, 2016). In both studies, music is claimed to support the expression of self, emotional regulation, as well as memory. Technological tools discussed in the two studies mainly sustain music sessions and communication.

[16] ACM Special Interest Group on Computer-Human Interaction, which is the premier international society for professionals and researchers who are interested in Human-Computer Interaction. Selected ACM SIGCHI sponsored conferences include: CHI, CSCW, DIS, UbiComp, UIST, Mobile HCI, TEI, ICMI, GROUP, ICIS, CHIMIT, C&C, ITS, EICS, RecSys, TOCHI.
[17] A few papers published earlier than 2012 in SIGCHI venues and other HCI journals and conferences (e.g., International Journal of Human-Computer Studies, British Computer Society HCI conference) are also included in the final list because of their close relevance to the topic.

2.4 Active Ageing and Social Participation in HCI: Technology Matters

Most selected articles are concerned with activities taking place in local areas, retirement communities, and interest-based communities, followed by leisure activities and communication practices in general. Although technology *per se* does not lie in the centre of these activities, cases of using various technological devices to sustain face-to-face events, facilitate socialisation, help with adaptation to new environment are evident. For example, Lindley and Wallace (2015) note the importance of "honouring cherished possessions" as older people are faced with the situation of moving to care homes. Their work calls attention to the interaction with technologies and possessions beyond the domesticate contexts (e.g., Kirk & Sellen, 2010; Odom et al., 2012) and among older people in particular. A similar notable category of activities is concerned with crafting and DIY (do-it-yourself). Technologies (i.e., hardware, software, and materials for crafting) play a role in reflecting personal values and perceptions of ageing that are closely tied to the historical and cultural values (i.e., Sun, Lindtner, Ding, Lu, & Gu, 2015), not to mention the role in sustaining community engagement and the making culture. Meanings of crafting echo that of other community activities, such as building a sense of community, maintaining social connectedness, a sense of accomplishment, and self-worth. The health benefits of these activities are implicitly mentioned in one of the cases in Taylor, Hurley, & Connolly's study (2016): The Men's Shed group put mental health of retired men as the central focus of their making practices, such that making itself becomes a secondary value. This resonates with what has been highlighted in section 2.1 and Vines et al.'s (2015) call: the older population is heterogeneous, and different levels of skills and various situated needs co-exist. In other words, if technologies are to sustain social participation, people's situated experiences, attitudes, meanings, and competences should be considered.

Seven articles are about social participation online: blogging, completing crowdsourcing tasks, learning programming languages, seeking and sharing information in online health communities. All studies in this category implicitly use the "challenge-response" approach (see Stenner et al., 2011), and pay special attention to meanings such as the development of identity, self-expression, self-achievement, and group engagement (e.g., Brewer, Morris, & Piper, 2016; Brewer & Piper, 2016; Kobayashi, Arita, Itoko, Saito, & Takagi, 2015). Technology, in these studies, stands in the centre of participation, through which people share

knowledge by "storytelling" and construct their identities by incorporating technologies into their social lives (Suchman et al., 1999). In particular, concerns of privacy, accessibility issues (may potentially affect older people's use, see Brewer et al., 2016), perceived usefulness, identity management online, and the reflection on personal and societal values through technology use have been explicitly mentioned in these studies. Privacy concerns and design implications with regard to specific technologies and contexts have been discussed. For example, Massimi et al. (2012) argue that the feeling of agency in terms of privacy management in online health communities is important for the acceptance of these technologies. Studies regarding the use of neighbourhood portals and local transportation apps (i.e., Hornung, Müller, Shklovski, Jakobi, & Wulf, 2017; Müller, Hornung, Hamm, & Wulf, 2015) suggest that privacy trade-offs between different stakeholders in neighbourhood communities needs to be managed. Also, McNeil et al. (2017) highlight a new dimension of privacy: the elders' tendency of disclosing to the self about the self when sharing health information. This dimension implies the possibility that older people may choose to "protect the self" from the knowledge about their health that may impact their self-concept negatively. Such information may further negatively impact their well-being. Light et al. (2017) suggest an indirect way of recommending local events to people living in an English town (e.g., *things* happening in their local areas rather than *who* is at the scene), so as to serve their information needs as well as protect their privacy. What can be implied here is that experiences, issues, tensions in relation to technology use and active participation need to be discussed alongside situated practices, relations, and wider contexts. This echoes Suchman's "situated action" viewpoint that rather than fixing the machines *per se*, it is essential to fix the relationship between human and machines when dealing with machine misbehaviour (see Suchman et al., 1999). Moreover, tensions concerning these technologies among other user groups (e.g., "*context collapse*" in online impression management among younger people, see Marwick & Boyd, 2011) warrant further study in particular with older people – an issue that we will return to in Chapter 3.

Competence-related findings among the selected articles are mainly concerned with people's technological skills as well as their beliefs, confidence, and efficacy of using technologies. A common theme is that the use of technology allows the older generation to regain control

over their personal and social life by connecting with others, participating in social activities, and seeking information online. This set of findings resonates with what has been highlighted in section 2.1 that agency beliefs guide how anticipatory scenarios are constructed and coped with (e.g., Bowling, 2008; Stenner et al., 2011), which potentially contributes to the health outcomes of the elderly. Particularly, Guo (2017) challenges the notion of "digital literacy" and argues that learning computer programming may potentially enable older people's life-long "skill sets", foster their social connections, and encourage them to create software that is meaningful for the older population in general. Another theme around competence is that older people's prior life experiences and wisdom should be highlighted in social participation, so as to empower them with a feeling of confidence and reciprocity, and with self-worth from benefiting younger people (e.g., Hope, Schwaba, & Piper, 2014; Rice et al., 2013).

This present review features the shortcoming that we solely focused on SIGCHI publications. Given the prevalence of HCI studies in Elsevier, Taylor & Francis, and Springer journals (e.g., International Journal of Human Computer Studies, Interacting with Computers, International Journal of Human Computer Interaction, Human Computer Interaction, Computer Supported Cooperative Work), we might have missed out on relevant studies that studied active participation and ageing from those journals.

In sum, existing studies in HCI highlight the importance of identity, competence, motivation, and values about active participation; some of the studies implicitly or explicitly speak to the core ideas of active ageing (i.e., health, participation). We will not discuss in detail about the discourse of ageing in these works because Vines et al. (2015) have already written about this exhaustively. However, relatively little is known about how and why people participate in group music-making and why they use technology in their situated ways. Moreover, though the meaningfulness of a sense of self is evident in existing research, the area of how identity develops and reflects people's behaviours of participation and situated technology use warrant further investigation.

Table 2-1 Selected empirical HCI studies on ageing and social participation

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Lazar & Nguyen, 2017)	Interview (n=24)	Non-music: leisure (at home)	Successful ageing; active ageing (participation)	Autonomy; access to resources.	**Motivation:** escapism (new), physical (new), cognitive, societal (stay busy, maintain physical and cognitive abilities, age appropriate), individual (autonomy, positive self-esteem, status, authenticity, identity), and connectedness (deriving companionship)	**Tech**: gaming, television, and technology in general **Roles**: to support the motivations of successful leisure activities by keeping people informed of nearby opportunities, pooling resources in support of different motivations
(Lee, Chaysinh, Basapur, Metcalf, & Mandalia, 2012)	Interview (n=9), focus groups	Non-music: collective activities in retirement communities	Active ageing (participation)	Self-efficacy in information sharing, active producers; Getting access to information from (i) WOM[5] and friendship circles; (ii) the directors of retirement communities	**Motivation**: self-actualisation, socialisation; "Activity circles" and a mini sense of belonging	**Tech**: ICTs, Social Network Sites (SNS) **Roles**: coordination of activities; support for activity/event discovery; support for personalised information sharing and discussion; measuring group interest; facilitating social support

2.4 Active Ageing and Social Participation in HCI: Technology Matters

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Taylor, Hurley, & Connolly, 2016) (Taylor, Clarke, & Gorkovenko, 2017) (Buehler, Branham, Ali, Chang, Hofmann, Hurst, & Kane, 2015)	Site visits (15 maker communities); workshops	Non-music: crafts, making, DIY	Positive (implicitly mentioned)[1]	The skills of using the crafts and things; A feeling of competence	A feeling of belonging to the "social space"; **Motivation**: getting social connectedness; maintaining well-being (an implicit motivation) **Motivations of organisers**: economic benefits; new business models to make communities sustainable; being a mentor; making assistive technologies for closed others (with disabilities)	**Tech**: hardware, software for making, conventional craft work **Roles**: to sustain community engagement and the creative making culture
(Sun, Lindtner, Ding, Lu, & Gu, 2015)	Ethnography	Non-music: Electronic hacking, DIY	Active ageing (implicitly mentioned); the distinctive status as an ageing population	Technological skills as a social elite that contributes to China's social and economic development	**Values** (particularly in Chinese culture): hacking as a memory practice to construct a techno-cultural national and cultural identity; reuse and resourcefulness; collective identity: "*we are a high-quality population*"; self-worth **Motivation**: personal fulfilment; social connectedness; improving the society as a whole; learning driven by peer pressure	**Tech**: electronic hardware and software for hacking and DIY; **Roles**: facilitating self-worth and values
(Lazar, Edasis, & Piper, 2017)	Field visits, case study, interview (N=13)	**Music**; Art therapy; Art making	Critical gerontology, positive /successful ageing	Confidence; people with dementia who are still able to sense, emote, and exist in the world	**Values**: art is an expression of the self **Motivation**: emotional attachment	**Tech**: digital and physical art therapeutically materials **Roles**: vehicle of communication; contextualising artwork with voice; support for memory; emotion exchange; multiple sensory

2.4 Active Ageing and Social Participation in HCI: Technology Matters

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Brewer & Piper, 2016) (Lazar, Diaz, Brewer, Kim, & Piper, 2017) (Brewer & Piper, 2017)	Interview (N=18); Content analysis	Non-music; blogging	Redefining "old age" and anti-ageism	Various skillsets (with blogging and technologies), sharing strategies for navigating ageism	**Values**: self-expression, social support; development of identity; meaningful engagement after retirement; a sense of community; social interaction; constructing collective identities	**Tech**: online blogging systems; digital artefacts **Roles**: supporting identity development; fostering self-expression; supporting sharing routinely; developing a captive and interactive audience
(Morrissey, Wood, Green, Pantidi, & McCarthy, 2016)	Ethnography for 4 months	**Music** sessions for people with dementia	Dementia care	Feeling, moving, voicing, playing, nestling	Shifting roles; sensitivity between researchers and patients; intimacy; making connection via movement	**Tech**: traditional props and technological prop (SwaytheBand); **Roles**: to support enriched experiences with music sessions such as authorship, communication, and creativity
(Gutierrez & Ochoa, 2016)	Interviews and home visits (N=60)	Non-music; family communication	-	Competence of use (technologies that are familiar or understandable to participants)	**Motivation**: expecting more frequent interaction with their grandchildren; **Values**: do not see the needs of adopting new technologies; appropriate family roles to facilitate filial practices	**Tech**: ICTs in general **Implications for adoption**: evident in addressing an unsatisfied and important need; being embraced by family; understandable and usable technology for the elderly
(Neves, Franz, Munteanu, Baecker, & Ngo, 2015)	Qualitative inquiries and usability tests (with the oldest old people)	Non-music: adoption of communication appliances	-	Digital literacy; practical competences of use; different levels of use; messages companioned with a variety of assists	Technology training sessions that involve family members are effective; user mental model	**Tech**: communication appliances **Implications for adoption**: social, attitudinal, digital literacy, physical, and usability factors; conceptual/practical ease of use; ambiguous affordance

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Piper, Weibel, & Hollan, 2013)	Case study and interviews with family and nursing staffs	Non-music: using a paper-digital photo album	Healthy ageing	Memory; self-paced learning,	Happiness; **Motivation**: to remember names, reflection on life events, social interaction and engagement,	**Tech**: a paper-digital photo album for curating and authoring **Roles**: to support reminiscence and reflection
(Stein, Meurer, Boden, & Wulf, 2017)	Contextual interview and prototype evaluation	Non-music: transportation and mobility practices	-	Flexibility enables autonomy; having information available is helpful in making transportation and activity strategies	Short- and long-distance serve different needs (short trips require more contextual information); events are cared more than POIs (places of interests)	**Tech**: a co-designed transportation platform accessible via a website, a mobile app and an iTV app **Implications for adoption**: reducing uncertainty, context information alongside transportation information; personalised informational access; information considering activity-related and situational needs
(Hornung, Müller, Shklovski, Jakobi, & Wulf, 2017) (Müller, Hornung, Hamm, & Wulf, 2015)	Participatory design	Non-music; engaging with a neighbourhood portal	-	Competences and confidences for really participating in co-design sessions and the usage of new media; confidence related to community-privacy trade-offs	Self-identity; perceived threats; self-empowerment; to allow low-threshold activities and to offer an open, welcoming space for older people	**Tech**: a neighbourhood portal **Roles**: technology de-stabilises the dialectic of relational practices and forces renegotiation **Implications for adoption:** enabling active operations of privacy settings may improve acceptance

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Kobayashi, Arita, Itoko, Saito, & Takagi, 2015) (Brewer, Morris, & Piper, 2016)	Interview; observation; survey	Non-music: performing online crowdsourcing tasks	Active ageing (participation)	Task autonomy, skills; self-efficacy	Intrinsic motivations; strong social contribution; personal interests; community identification; external obligations; personal capital advancement; gamification; personal, societal and financial incentives	**Tech:** online crowdsourcing platforms **Barriers for adoption**: accessibility issues
(McNeill, Coventry, Pywell, & Briggs, 2017)	Sociogram and interview	Non-music; sharing health information	-	The feeling of control over one's multifaceted identities; active seeking information	Identity and impression management; another dimension of privacy – the disclosure to the self of information about oneself;	**Tech:** privacy settings of ICTs in general **Roles**: privacy settings that provide positive feedback to protect one's self-concept, supporting active information seeking
(Caldeira, Bietz, Vidauri, & Chen, 2017)	Interview and observation	Non-music; self-care and collaborative care activities in a CCRC (Continuing Care Retirement Community)	Successful ageing (implicitly mentioned)[1]	Individual control among care givers, seniors, family and friends	The balance between individual control and safety is nuanced and dependent on the context; emotional responses	**Tech:** specific devices for self-care and collective care practices (e.g., monitoring systems) **Implications for adoption:** the tendency of staying with mainstream devices; monitors or reminders with emotional connotations
(Hope, Schwaba, & Piper, 2014)	Interview	Non-music: communication practices	-	Wisdom and experiential support for younger people	Strong tie relationships; expressing thoughtfulness and concerns in communication	**Tech:** social media **Implications:** heavyweight communication is better sustained with material social communication (i.e., letter writing)

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Lindley & Wallace, 2015)	Interview and design probes	Non-music: moving to care homes	Age in place, successful ageing (implicitly mentioned)[1]	Self-efficacy and self-esteem from learning new skills to improve the adaptation to new social environments	The need to get access to relinquished possessions; making, showing and sharing possessions; the need to make communal spaces in care homes relational, historical and concerned with identity; the value of activities; demonstrating nurtured skills	**Tech:** possessions in general **Roles**: the help with the compromises of moving to care homes; to support the adaptation and integration into new social settings
(Light, Howland, Hamilton, & Harley, 2017)	Interview, participatory design	Non-music: neighbourhood, social activities	Active ageing (participation)	-	**Motivation** (of place): spot; site for encounter; a source of pride **Values**: sociality; town identity; privacy and safety;	**Tech:** embedded digital tools, information displays **Roles**: to support sociality, to support specific needs for retirees
(Morrissey, Garbett, Wright, Olivier, Jenkins, & Brittain, 2017)	Design workshop	Non-music: dementia-support activities	Dementia care, ageing in place	-	Trust of reviews on the app; exclusion and inclusion; the duration and quality of time; exchanging experience and affects; building empathy	**Tech:** a mobile app to mark dementia-friendly public places **Roles:** to support caregivers and people with dementia; to provide information exchange opportunities for caregivers
(Rice, Tan, Ong, Yau, Wan, & Ng, 2013)	Observations, questionnaire, interview	Non-music: Playing games with Xtreme Gardener	-	Age-specific skills that are useful for exchanging in gameplay; prior knowledge	**Motivation**: enjoyment; physical fitness (secondary motivations); communication	**Tech:** Xtreme Gardener **Roles:** to encourage communication and mutual exchange of ideas

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Massimi, Bender, Witteman, & Ahmed, 2014) (Massimi, Dimond, & Le Dantec, 2012)	Qualitative, case study	Non-music: engagement with online health communities	Life transitions (including ageing-related transitions)	Expertise (in relation to coping with life transitions); user agency of privacy management;	Reciprocity other than emotional support; demonstrating the expertise of experienced members; reintegration to the community; transition to face-to-face activities; the formation of new social relationships	**Tech:** online health communities in support of life transitions, ICTs, social media **Roles: to** provide socio-technical support; opportunities for new routines; establishing new communities; a symbolic role of how people achieve the new normal; to help reconfigure old technologies to reflect new ways of living
(Vines, Blythe, Dunphy, Vlachokyriakos, Teece, Monk, & Olivier, 2012) (Vines, Dunphy, Blythe, Lindsay, Monk, & Olivier, 2012)	Participatory design; interview	Non-music; digital and cheque payment practices	-	The competences of doing online banking	Technology used by the community is more likely to be adopted; knowing who will be helping with the transaction in the "Cheque mate" process; new technologies "cost money"; the importance of paper in cheque payment; flexibility; trust	**Tech:** a digital cheque book based on the Anoto digital pen technology **Roles**: to support existing, trustworthy, collaborative payment practices
(Sayago, Forbes, & Blat, 2012)	Ethnography	Non-music; online video consumption	-	Prior experiences /skills /strategies of technology	Lacking the perceived benefit of uploading videos online; commenting on videos in f2f, e-mails with closed others	**Tech:** YouTube (and SNS in general); email

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Molapo, Densmore, & DeRenzi, 2017)	Qualitative	Non-music: mobile videos consumption	Positive ageing	Digital literacy; prior knowledge of technology; physical (failing eyesight); perceived ease of use	Age is not an obstacle of technology use; the topic relevance determines use	**Tech:** mobile videos **Roles**: to support health education
(Sun, Ding, Lindtner, Lu, & Gu, 2014)	Interviews (N=17)	Non-music; daily activities	Active ageing	The competence of using and learning new technologies	Senior identities shaped by historical aspects (e.g., emphasising steadiness and stability); identities in change and requiring continuous enactment and negotiation; social pressure from peers	**Tech:** ICTs in general **Roles:** to help negotiate senior identities; to express and reflect value systems and life attitudes
(Waycott, Davis, Veter, Morgans, Gruner, Ozanne, & Kulik, 2014)	Field study	Non-music; formal aged care services	Ageing in place, aged care	-	Boundary work (temporal and spatial); psychological support from a knowledge of the caregiver; supportive content **Motivations** (communication-related): encouragement; keeping in touch; responding to clients' (older people) interests; sharing the care manager's life	**Tech:** an iPad application for photo sharing and communication **Barriers of adoption**: time constraints and consequential insufficient boundary work
(Balestrini, Bird, Marshall, Zaro, & Rogers, 2014)	Qualitative with technology intervention	Non-music; local heritage protection practices	- (not ageing specific but relevant)	Media literacy, skills of digital story telling; age-specific experiences (to teach the next generation)	A sense of community; recognition; pride; to involve multiple stakeholders; social encounters; novelty and usefulness of technologies	**Tech:** CrowdMemo (a community ICT intervention to preserve local heritage), digital camera, mobile phones **Roles**: to facilitate f2f social encounters; to facilitate adoption by providing clear instructions and using off-the-shelf technologies

Authors	Study Design	Type of Activity	Discourse of Ageing	Competences[2]	Meanings[3]	(Roles of) Technologies[4]
(Lindley, Harper, & Sellen, 2009)	Focus groups	Non-music; communication practices with closed others	-	Experiences; skills	A level of intimacy (e.g., writing or voice); the focused, intense means of communication; non-intrusive communication; reciprocity; the knowledge about the digital identity of a loved one	**Tech:** working prototypes (HomeNote, Epigraph, Whereabouts Clock)
(Durrant, Kirk, Trujillo-Pisanty, Moncur, Orzech, Schofield, Elsden, Chatting, & Monk, 2017)	Qualitative with design probes	Non-music: daily activities	Active ageing (implicitly mentioned)[1]	Skills of technology, prior experiences, wisdom	Identity development over time and from offline to online; complex identities in the context of life trajectories; self-reflection; well-being	**Tech:** OnLines (a design research artefact that enables the visualisation of key online services use) **Roles**: to foster reflection; to mediate the construction of self
(Salovaara, Lehmuskallio, Hedman, Valkonen, & Näsänen, 2010)	Diary study, interview	Non-music; life interests and technology use practices	Active ageing	A sense of control over life changes	Conflicting "possible selves"; different dimensions of transitions; the pragmatic views of technologies; reflection and deliberation on future life	**Tech:** ICTs in general **Roles:** to be integrated into everyday life; to aid the coping with transitions; important triggers for transitions
(Guo, 2017)	Survey; interview	Non-music; learning computer programming	Active ageing (implicitly mentioned)	Skills of programming; perceived cognitive decline	**Motivation**: learn to keep their brains challenged; to make up for missed opportunities during youth; to connected with younger family members; to improve job prospects	**Tech:** Python Tutor (a programming education website) **Roles**: in support of learning programming languages

Note: 1 – "Implicitly mention" means that the authors do not explicitly write about terms such as active/successful/positive ageing. However, concepts and elements of these terms are included implicitly in the results, according to our interpretation and analysis.

2 – The categories "competence", "meanings" are inspired by Elizabeth Shove's social practice theory. However, some published articles do not cover findings of both aspects or cover them explicitly, therefore the information in this table may not be entirely complete.

3 – The category "meanings" may include sub-themes, such as "values" (holistic value of this group of participants), "motivation" (especially applied in concrete cases such as use or not use certain technologies, participate or not participate in activities, etc.).

4 – The category "(Roles) of Technologies" may include sub-themes, such as "Tech" (the domain of technologies or research/design artefacts used in the study), "Roles" (the roles that technology plays in the study, if explicitly mentioned by the authors), "Implication for adoption" (implications, suggestions proposed in relation to adopting the certain type of technologies described in the study), "Barriers for adoption" (factors that are explicitly mentioned to be barriers of adoption), "Implications" (general implications in relation to the certain type of technologies described in the study)

5 – Word of mouth

2.4.2 The use of music-related technologies

The first theme is music sharing. Music sharing, as a practice that is "richly linked to other social activities" (Brown, Sellen, & Geelhoad, 2001), covers a variety of topics in HCI literature: adoption, privacy, impression management, intimacy, and the discovery of new music. Before the wide application of peer-to-peer sharing paradigms (such as Napster and Spotify), conventional music sharing often occurred among friends and families. One's friendship circles act as a "collaborative filter" when discovering new music (Brown et al., 2001). When music and related devices go digital, sharing becomes complex and dynamic. Prior studies identify two opportunities for technology design in response to the increasingly complex nature of music sharing. The first way is to support multiple identities of users (Brown et al., 2001; Voida, Grinter, & Ducheneaut, 2006). People curate and share music collections, as their shared music function as symbolic representations of the sense of self (Lindley, Marshall, Banks, Sellen, & Regan, 2013; Voida, Erickson, Kellogg, & Mynatt, 2004). For example, in a study on how people share, organise and get access to home media collections, Sease and Mcdonald (2009) find that owners of shared music content may adjust their presentation of self to avoid negative impressions. For example, a DJ may want to play music he likes, but also please his audience by modifying his playlist (Sease & McDonald, 2009). The second opportunity is to consider different levels on the intimacy spectrum (Sease & McDonald, 2009). The level of intimacy interacts with the expertise of the music owner, the proximity between the owner and audiences to be shared, as well as the size and uniqueness of the collection.

The above two opportunities for music sharing also apply to social media. As one of the significant drivers of media sharing on Facebook, music discovery is enabled by peer influence on social network sites (Karnik, Oakley, Venkatanathan, Spiliotopoulos, & Nisi, 2013), which is similar to what people do offline with their friends (see "collaborative filter" in Brown et al., 2001). The consideration of peer influence may contribute to the design of

music information retrieval algorithms[18], which have been extensively used in existing systems such as iTunes (Voida et al., 2004), YouTube, and Spotify. Algorithms that incorporate what one's friends listen to and share may be proximate to user needs (e.g., Lee & Cunningham, 2013; Lee & Waterman, 2012; Lee, Wishkoski, Aase, Meas, & Hubbles, 2017). Social interaction, another valued driver for sharing media on Facebook, refers to the gratification of finding people with the same tastes and identities. Following Feld's theory on the organisation of social ties (Feld, 1981), researchers of social media argue that social media objects act as foci to enable social interaction and the formation of social relationships (e.g., Karnik et al., 2013). Technologies that attempt to facilitate social interaction draw on such social media objects, which include data with regard to users' online traces such as comments, approvals ("likes"), and the content of their posts. Research on media sharing argues that the sociality functionalities (e.g., commenting, posting, and "likes") help with the formation of ties (Feld, 1981) and enhance the commitment and a sense of belonging towards online communities (Farzan, Dabbish, Kraut, & Postmes, 2011; Rotman & Preece, 2010).

Moreover, social media is gaining attention among musicians. Shklovski et al. (2010), in a longitudinal study of musicians in the aftermath of Hurricane Katrina in New Orleans, find that musicians adopt and adapt computer-mediated communication and information seeking tools for personal and community use (e.g., maintaining the connection with their prior local communities after moving away from New Orleans). In a study with college choir members, O'Flynn (2015) identifies four types of Facebook communications: sharing of information, commentary after performances and other events, sharing of music files and general expressions pertaining to everyday events and personal feelings. Hoare, Benford, Jones, & Milic-Frayling (2014) argue that amateur musicians heavily rely on online tools (including social media) for scheduling their promotional activities. Taken together, social media, as well as ICTs in general, is influencing the way in which music is shared and bringing new

[18] Features that use music information retrieval algorithms include (but are not limited to): web radio stations, personalised music search, recommendations tailored to users' music tastes and music consumption patterns, algorithmically curated playlists, etc. (Lee, Wishkoski, Aase, Meas, & Hubbles, 2017).

opportunities for music sharing paradigms in either individual settings and social settings (i.e., musicians, choir members).

The second theme is concerned with the notion that music puts people "*in a reminiscent frame of mind*" (Bentley, Metcalf, & Harboe, 2006), and it resonates with a large body of work on music and memory among the elderly (e.g., Schulkind, Hennis, & Rubin, 1999; Wakeling & Clark, 2015). In terms of digital music services, reminiscence is among one of the important intentions of use (Bentley et al., 2006). Lindley and Wallace (2015) noted that music streaming services could potentially mitigate the effect of relinquished possessions by either providing digital file archiving or being regarded as a compensation strategy for loss. As for systems specifically for older people, Piper and colleagues developed an audio-enhanced paper photo system that helps provoke memory, assist story-telling, so as to enhance emotional well-being of older people (Piper, Weibel, & Hollan,, 2013; Piper, Weibel, & Hollan, 2014). Riley, Alm, and Newell (2009) developed a prototype that aims to enable people with dementia to create music and report positive experiences among their participants. However, these studies are limited, in the sense that some of them are constrained to populations that require dementia care, and some of them lack the consideration of people's situated needs and contexts, therefore are less likely to legitimate future use (i.e., Riley, Alm, & Newell, 2009). Moreover, it is still unclear how healthy, active older adults use technology surrounding active music participation, and what challenges may arise and how they would respond. Therefore, a more nuanced look using the "situated action" approach and considering the intricate nature of everyday practices is needed.

2.4.3 Technology adoption

A related vein of research is concerned with the adoption of emerging technologies. Having an "interdisciplinary" nature (Blackwell, 2015), HCI research with respect to the adoption of technology has been influenced by "a few differing disciplinary perspectives" (Lindley et al., 2017). One strand of the technology adoption literature is about the Technology Acceptance Model (TAM) (e.g., Davis, 1989), which has been widely used in Management Science and Information Systems (Lindley et al., 2017). TAM investigates whether a system is adopted or

not (usually in business companies) based on two constructs: perceived usefulness and perceived ease of use. Perceived usefulness is referred to "*the degree to which a person believes that using a particular system would enhance his or her job performance*" (Davis, 1989, p. 320). Perceived ease of use is termed as the belief about the probability that one can use a particular system without much effort (Andriessen, 2012). In addition, the level of perceived ease of use has a positive impact on the level of perceived usefulness. Prior research argues that older adults utilise a benefit-driven approach when using and perceiving new technologies, which resonates with perceived usefulness in TAM (Davis, 1989) and similar theoretical constructs such as meaningfulness and the perceived quality of products. As such, older people's benefit-driven approach leads to the different use of digital technologies. For example, young people mainly attempt to produce digital videos for self-expression, whilst the contents of videos created by the elderly are mainly for archival use (Ferreira, Sayago, & Blat, 2017). The conceptualisation of perceived ease of use resonates with concepts such as perceived control and the confidence of using technologies (e.g., locus of control and self-efficacy; see Ajzen, 2002), and is found to play a role in technology adoption when the elderly are already aware of the technological innovation (Damodaran, Olphert, & Sandhu, 2014; Melenhorst, Rogers, & Bouwhuis, 2006). However, TAM has been criticised for failing to account for "the true complexities of socio-technical relationship" (Lindley et al., 2017) because TAM-derived findings are often constrained to specific contexts (i.e., a particular system for a particular corporation). It may be that a variety of factors, such as the complexities of use, the nature of tasks, as well as individual differences may alter the predictability of perceived ease of use and perceived usefulness (Adams, Nelson, & Todd, 1992) in technology adoption. As such, TAM is not able to unpack the subtleties of technology use nor provide meaningful insights for understanding how people use technologies in routine, complex and situated life.

In contrast to the tightly scoped TAM tradition (Lindley et al., 2017), anthropologist Lucy Suchman, as mentioned in section 2.4, takes into account the complex "*material and social circumstances*" (Suchman, 2007) in relation to technology use. Suchman provides a subtler approach to illuminate the complexities of daily practices and effectively tackles the limitation of TAM-related methods. Moreover, this approach implicitly decentres technology

by incorporating contextual, social, personal and technological factors. As Suchman put it, "*individual technologies add value only to the extent that they are assembled together into effective configurations*" (Suchman et al., 1999, p. 399). We then turn to another school of thought – social studies of technology.

Similar to Suchman's notion of "situated action", social studies of technology observe many complex and mutually interdependent factors in relation to the contexts and actors and seek to answer questions such as how are technologies shaped by users, and what it means for them to be "adopted" (Lindley et al., 2017). According to Lindley et al. (2017), these theories are particularly valuable for "*packaging speculations about the potential future adoption of a currently emerging technology*" (p.271) but intentionally different, making it impossible to find a unifying framework. Theories in relation to technology adoption entail technology appropriation (Dourish, 2003), domestication theory (Silverstone, 2005), and social practice theory (Shove, 2007). Technology appropriation is defined as a process in which an individual integrates technology into his or her ongoing practices, and may invent new types of repurposive[19] use (Dourish, 2003; Salovaara, 2012). The concept of technology appropriation adopts ideas of "situated action" (Suchman, 1987), change (Orlikowski, 1996) and local adaptation and local design (Hutchins, 1991), assuming that the appropriation process is not only determined by a set of planned strategies, but also affected by external factors, individual differences, interests, and new interpretations (Andriessen, 2012). Technology appropriation is relevant in understanding how valid the results will be when most of today's adults, who have skills and experience with existing ICTs, grow older (Ferreira et al., 2017; Hanson, 2009). Domestication theory holds a "cyclical and reciprocal" perspective (Lindley et al., 2017) by describing how technologies are configured into everyday life through appropriation[20] (as the main activity towards ICTs), objectification,

[19] The origins of the word "repurposive" in the context of the present discussion go back at least to Dourish's (2003) research on the appropriation of interactive technologies. That is, a user discovers a new purpose of use of technology, which was not known by the user nor designed originally. Following Suchman's notion of situated action, technologies are "implicated in and subject to the reconfiguring and repurposing" of practices and settings in relation to technology use.

[20] The conceptualisation of "appropriation" in domestication theory is different from that in "technology appropriation". Here appropriation is referred to the acquisition of technologies.

incorporation, and conversion, and how users adapt to new circumstances driven by the adoption of technology (Silverstone & Haddon, 1996). However, it would not be possible to review these theories exhaustively (except for social practice theory, which we have reviewed in detail and will use it as a theoretical lens for data analysis in Chapter 3), and it is beyond our scope to provide a detailed review of all relevant theories. Rather, the aim of briefly reviewing a few theories in this strand here is to highlight the "breadth" of existing knowledge (Lindley et al., 2017) of technology adoption, and demonstrate why it is necessary to contextualise technology use, practices, and their constituent components (i.e., competence and meanings).

Although concepts such as appropriation and domestication are useful for understanding technology adoption, Shove and colleagues argue that these concepts fail to account for the cumulative and collective consequences after domestication or adoption (Shove, 2007; Shove et al., 2012), and they put this forward by proposing social practice theory. Social practice theory is concerned with how practices, alongside elements including things, competences, and meanings, form and co-evolve so as to inform the trajectories of emergent entities (also termed as practices-as-entities in the vocabulary of social practice theory, see section 2.4). Shove et al. (2012) claim that their "elemental approach" enables researchers to track the changing configuration of practices over time, and in this sense, resonates with Suchman's (1999) notion of "effective configuration", as well as Rip and Kemp's (1998) "configuration that works". Social practice theory de-centres human actors and technologies (or the so-called artefacts in the sociology literature) but centralises *linkages* between things, competences, and meanings. This points to the sheer difference between social practice theory and behavioural models such as TAM in terms of the unit-of-analysis: TAM and relevant behavioural models focus on individual and technological attributes, whilst social practice theory treats practice as its focal point of interest. Therefore, the attempts to merge the theory of social practices and behavioural theories are not likely to be successful (Shove, 2010). Nor is it our attempt in this dissertation.

The focus of this dissertation is to elucidate the situated use of technology via an understanding of community music participants' social life. Technology use is regarded as an

analytical "tool", to shed light on the dynamics of *doing*, *having* (Shove, 2007) and *learning* (to use technologies, as will be highlighted in Chapter 3), or in sociologist Jean Kaufman's words (1998), a tool to stimulate narratives. HCI scholar Paul Dourish (2006) made it clear that technology use and everyday practices are not mutually exclusive. We argue that the lens of social practice theory enables us to understand how community music participants experience meaningful participation in their old age and to make sense of the role of technology in active participation. In other words, this dissertation adopts a less strict interpretation of practice: why *doing* is meaningful, what competences and "motivational knowledge" that *doing* requires, and as a consequence, to inform the ways in which active ageing could be enhanced. Though all of the concepts are fascinating, an in-depth introduction of them is not necessary for our core argument. Instead, the awareness of limitations of TAM, the concept of "situated action" and the appropriateness and the level of granularity of social practice theory in understanding social lives of community music participants, is sufficient to grasp the core rationales in this dissertation. In particular, in Chapter 4, we will further validate the qualitative findings in Chapter 3 with regard to the use patterns of digital music technologies, as well as the associations between use, competences (i.e., self-efficacy), and meanings (i.e., motivation).

2.4.4 The psychological basis of motivation and self-efficacy on technology use

Here we begin by reviewing how motivation is linked to identity development, which spells out the meaningfulness of technology use. We then move to theoretical and empirical work with respect to motivation and self-efficacy in music technology use. Because practically all of the prior research (especially with music technology use) has relied on younger participants, we know next to nothing about whether similar use patterns and associations apply to the middle-aged and old cohort.

2.4.4.1 Motivation and identity development

In section 2.3.1, we have reviewed prior work on *possible selves* (Markus & Nurius, 1986; see also Creech, Varvarigou, Hallam, et al., 2014). The concept of *possible selves* concerns the link between self-concepts and the future, which has also been implicitly tackled by symbolic interactionists. Symbolic interactionism is concerned with the social production of meanings (Blumer, 1986). Its underlying assumption is that "*society exists in action and must be seen in terms of actions*" (Blumer, 1986, p. 6). From the interactionist perspective, the self can be seen as an organiser of future-oriented behaviour (Markus & Nurius, 1986) and contributes to the ability to conduct possible actions that are learnt from others' salient selves (Mead, 1934). Extending this line of thought, sociologists (e.g., Foote, 1951) argue that *motivation* is a consequence of identities; future-oriented selves motivate people to rehearse possible actions to validate their self-concepts (see Markus & Nurius, 1986). In addition, psychologists conceptualise goals or ideals as vital parts of self-concepts and link motivation to self-concepts (e.g., the concept of self-definition; see Gollwitzer & Wicklund, 1985) to explain the mechanism through which the future-facing selves connect with specific actions. For instance, Erikson (1968) argues that identity formation is driven by psychosocial developmental challenges. Such challenges differ at different life stages: from forming a coherent identity in adolescence to constructing social connections and emerging social roles in young and middle adulthood, and to emphasising familial themes in old age. Different life stages encompass different goals of identity development and convey different motives, preferences, and actions. To this end, motivation can be interpreted as efforts to relate the goals, mediated by the future-oriented identities, to actions (Markus & Nurius, 1986).

The future-oriented notion of identity development applies to the enactment of digital identities, and has been highlighted in social media research and online media practices (e.g., Orzech, Moncur, Durrant, & Trujillo-Pisanty, 2018; Zhao & Lindley, 2014). For example, Orzech, Moncur, Durrant, James, & Collomosse (2017) found that older people have an outward lens with their camera and tend to be observers in online photo sharing practices. O'Hara and Brown (2006), in a study of music sharing and identity management with iTunes, highlight the role that iTunes plays in allowing individuals to judge and value others'

collection of music, forming an impression of others and awareness of their own identities. They also find music expertise as a motive to share music with others. Likewise, Krause, North, & Heritage (2016) specify the association between psychological factors and music technology use. They identify an identity based on music technology and demonstrate that the investigation of the psychological variables (e.g., self-efficacy, innovativeness) contributes to a better understanding of music technology use. Among the many psychological variables, Krause et al. (2016) also note that individuals' music preferences make the linkage between identity management and music technology use complex. Krause et al.'s (2014) work builds upon the considerable evidence in social psychology concerning the association between music preferences and individual differences (e.g., Rentfrow, 2012; Rentfrow & Gosling, 2003, 2006). Moreover, Greasley et al. (2013) investigate the link between music preferences and music engagement, and highlight that more musically engaged participants show a stronger commitment to musical styles, carry out more complicated ways of collecting and managing their music, and are more likely to share their music and opinions with others and are motivated to acquire new music.

Taken together, an angle of the motivation and psychological needs of use may shed light on music engagement and its association with identity development. A few studies have highlighted the developmental nature of music preference and identity (e.g., Bonneville-Roussy et al., 2013). However, it is still unclear whether existing findings on music technology use that are drawn from younger participants could be applied to middle-aged and older participants. Therefore, we need to investigate the motivations of music technology use and ground motivations and identity development in older people's technology use.

2.4.4.2 Uses and gratification theory

A substantial vein of research concerning motivation and technology use adopts the Uses and Gratifications (U&G) Theory. U&G theory initially concerns mass media consumption and explains how individuals use communications to satisfy their needs and to achieve their goals (Katz, Blumler, & Gurevitch, 1973). This approach is under the following central assumptions (Katz et al., 1973): (i) the audience is active in selecting media rather than

passively receiving it; (ii) the audience is active in linking their psychological and social needs to media choices; (iii) media competes with other sources of needs; (iv) the audience is self-aware of their goals and needs in consuming mass media. U&G covers a wide variety of areas of research: gratification and use, the psychological and social significance of needs, media effects and gratifications, and audience activities (Palmgreen, 1984). More importantly, Internet researchers theoretically position Internet Technology as a "legitimate subject of mass communication and social science research" (Ruggiero, 2000; see also Morris & Ogan, 1996). Similarly, many researchers have applied the U&G approach to understanding the motives and consequences of using new technologies. Here we proceed to review this strand of research, so as to situate this present research (discussed in Chapter 4) in this space.

A relatively less tackled aspect of U&G is the social and environmental origins of people's needs and gratifications (Katz et al., 1973). One of the social and ecological roots of needs is to sustain the membership of valued social groups and social affiliation (Katz, Blumler, & Gurevitch, 1974). That is, individuals turn to media consumption to meet their socialising gratifications (Baumeister & Leary, 1995) and to achieve a certain level of belongingness (see Zolkepli & Kamarulzaman, 2015). The significance of social connectedness has also been confirmed by studies concerning the use of ICTs (e.g., Phang, Kankanhalli, & Sabherwal, 2009). For instance, Zolkepli and Kamarulzaman (2015) argue that gratifications of social connectedness entail two sub-dimensions: social influence (Dholakia, Bagozzi, & Pearo, 2004; Venkatesh & Davis, 2000; or subjective norms in the theory of planned behaviour, see Ajzen, 1991) and social interaction that facilitates the completion of shared goals and reinforces established relations (e.g., Gutierrez & Ochoa, 2016). Both social influence and social interaction have been found to be associated with willingness to adopt and actual use of technological systems (Zolkepli & Kamarulzaman, 2015). In particular with music technology use, researchers identify socialising and communication as important gratifications of using online music technologies (Chou & Liu, 2016; Krause, North, & Heritage, 2014).

Another social and ecological root of needs concerns seeking information from media consumption (Katz et al., 1973). This also finds some space in the communication and HCI literature. For instance, Magsamen-Conrad et al. (2015) identify information seeking as an important use of iPads among older people. Earlier studies on the use of Computer-Mediated Communication (CMC) technologies (Ku, Chu, & Tseng, 2013) and engagement with social network sites (SNS) (Park, Kee, & Valenzuela, 2009) also highlight information seeking as a vital component of technology use. Notably, in the context of music technology use, seeking information and discovering new music pertain to important instrumental motivations (e.g., Karnik, Oakley, Venkatanathan, Spiliotopoulos, & Nisi, 2013; Krause et al., 2014).

It is worth noting that the motivation of information seeking conveys one of the core assumptions of U&G, that the audience is active and purposeful in selecting media and using technology. Moreover, active and purposeful information seeking and music discovery are associated with social utility motives (e.g., discussing music content with others, expressing the selves), and may lead to music-related social interactions (Belcher & Haridakis, 2013). In a study of music technology uses and motivations by Krause et al. (2014), the motivation of musical entertainment overlaps with information and discovery. As such, the two motives, information seeking and socialising, are not necessarily mutually exclusive.

2.4.4.3 Self-efficacy and technology use

Self-efficacy refers to the judgement of one's capabilities to perform a given task. Based on social cognitive theory (Bandura, 1989; Compeau, Higgins, & Huff, 1999), self-efficacy plays a vital role in how people approach goals and deal with challenges. Human behaviour follows a path through which expectations might change with self-efficacy, and in turn, the decision of how much effort to invest, how long to persevere, and what strategies to use are then influenced (Mun & Hwang, 2003). Self-efficacy has been used widely in the ageing literature: agency beliefs guide how the anticipatory scenarios are constructed and coped with (Baltes & Carstensen, 1996; Bandura & Jourden, 1991). It is critical in studying and measuring the domain-specific self-efficacy beliefs and corresponding specific tasks (Bandura, 1977).

Self-efficacy has been found to be positively associated with technology use by influencing the perceived ease of use and perceived usefulness of technology (Kwon, Choi, & Kim, 2007). Also, application-specific and domain-specific self-efficacy show better predictions than general computer-use self-efficacy (Mun & Hwang, 2003). In particular, among older technology users, a general observation is that older users may consider themselves not competent enough to benefit from new technologies (e.g., Chen & Chan, 2011; Czaja, Charness, Fisk, Hertzog, Nair, Rogers, & Sharit, 2006; Lee & Coughlin, 2014). As such, more recent research attempts to frame older adults as active collaborators in the technological development culture (e.g., Flandorfer, 2012; Joyce & Loe, 2010) and to encourage the development of new skills and the shifting embodiment of new skills in their sense of agency (Vines, 2011). Krause and North (2016) highlight the importance of self-efficacy in the use of music technology in everyday life. Existing research provides good reasons to believe that music technology-specific self-efficacy might enhance more frequent use and a higher level of music technology engagement, and may shed light on the lines of enquiry with regard to community music participation.

In sum, research on the link between music technology use and motivation, identity and self-efficacy provides a psychological basis for technology use. However, existing enquiries have been heavily focusing on the relatively younger participants or music listening in general, and we do not know whether community music participants use digital music technologies in similar patterns or whether the magnitude of these associations between psychologically significant components and use can be generalised.

2.5 Chapter Summary

This chapter provides an overview of theoretical concepts, frameworks, and empirical studies on active ageing, social participation and technology use. Our review also points to knowledge gaps in terms of the subtleties and subjective meanings of social participation for active ageing and how technology use mediates participation. This dissertation addresses these gaps by contributing a more nuanced understanding of how and why older people use

technologies for community music participation in their particular ways, and by illustrating how this knowledge can inform active ageing research and practices. In particular, we will compare our findings on community music participation against the broader range of social participation in the HCI literature (see section 3.3.2).

Chapter 3 Meaningful Participation and the Situated Use of Technology in Community Music

The first objective of this dissertation is **to uncover the experiences of meaningful participation and technology use in community music**. It entails the first and second research question of this dissertation. In this present chapter, we provide answers to the two research questions. Research question 1 focusses on conceptualising community music participation and research question 2 centres on technology use in the context of community music. Data from the participant observation, the diary study, and the interviews was used to answer research question 1, whilst research question 2 draws on data from the interviews and the diary study (mainly the "social diagram" task). The design of the diary study and interviews is based on findings from the participant observation.

3.1 Research Question 1: Meaningful Participation in Old Age

This section set out to address the first research question of this dissertation: **how do late middle-aged and older people participate in community music activities?**

3.1.1 Background

Participation in communal activities is often associated with maintaining social bonding, staying healthy, and keeping active when people step into late midlife and old age. The role of local community in achieving well-being in old age has been well documented (e.g., Adams et al., 2011; Stenner et al., 2011; Stephens et al., 2011). Prior research suggests that people's sense of autonomy, social affirmation, and a sense of belonging are means by which people are able to navigate the process of ageing (Creech, Hallam, Varvarigou, Gaunt, et al.,

2014). In the case of community music – an exemplar of collective social participation in old age (Bukov et al., 2002) – such identifications are constructed through participation. Moreover, the benefits of community music participation in old age resonates with the active ageing literature, which suggests that having an appropriate perception of the self (Kroger & McLean, 2011), formulating, constructing, and maintaining social cohesion (Pearce, Launay, & Dunbar, 2015) are essential for coping with life changes in old age.

Technology for active ageing and well-being has become an important topic in HCI. As we have noted in Chapter 2, digital solutions in support of active ageing recently demonstrate a shift from focusing on *addressing* problems due to deficits faced with older people to *understanding* the elderly as competent and motivated actors in maintaining healthy and active lives through social participation. Moving forward, this study aims to understand how late middle-aged and older adults engage in community music activities. In particular, this study set out to examine the experiences of being a "committed member" (Shove et al., 2012) and the dynamics of participation in relation to the development of identity. We limit our focus to community music rather than the intergenerational relationship or social activities generally, so as to understand community music engagement from the perspective of active ageing and music.

Community music was chosen as an exemplar of the many forms of social participation in old age for three reasons: First, Cambridge is known for its unique music culture and an unusually large population of local musicians. This population is mainly later mid-aged and older and stably attends community music on a regular basis. This enables us to observe individuals' learning practices and identity development *in situ*. Second, group singing, as a "universal human behaviour" (Pearce et al., 2015), provides "social spaces" (Taylor et al., 2016) for active engaging, learning, and socialising among the elderly. To this end, we assumed that an investigation with community music participation may shed light on active ageing in similar "social spaces" more generally. Third, prior research shows that many musicians are highly independent and technologically savvy (Shklovski, Burke, Kiesler, & Kraut, 2010), using various instruments and technology when they "perform and record music". Community music practitioners are also interested in the potential benefits associated

with cloud technologies and streaming technologies (e.g., Doebele, 2012; O'Flynn, 2015). Drawing from sociology work on social practices arguing that technological tools are the essential "stuff" of practices (Shove, 2007, p. 70), a focus on community music may open up opportunities to further investigate the emergent experiences of using digital technologies. This research question is explored with the following sub-questions:

- **RQ1.1: Why and how are participants "recruited" and "captured" in CM practices?**
- **RQ1.2: How do participants learn music *in situ*?**
- **RQ1.3: What are the characteristics of community music participation?**

3.1.2 Method

Our proposed situated practices call for a methodology that is sensitive to the subjective, lived experiences of participation and the individual and social settings surrounding it. We adopted a mixed-method, qualitative approach using ethnographic inspired techniques that include participant observation, a week-long diary study, and semi-structured interviews. The use of ethnographic inspired techniques provided a holistic perspective of community music participation and enabled a deepened understanding of individuals' experiences and attitudes. It does not mean that this is a traditional, "full" ethnography within anthropology, which usually takes months or years to understand the interdependence of various aspects of a phenomenon and how it evolves. Instead, we rely on open-ended approaches to "*enquiry into the complex, socially-organised settings*" of community music participation and to "*illuminate the relationship between technology and practices*" (Dourish, 2006, p. 548). As will be further elaborated in the findings and discussion section, the data and analysis were sufficient to provide answers to our first research question in this dissertation – how people participate in community music activities meaningfully. In the following sections, we introduce the methods used in the chapter and highlight how the analysis in section 3.1was conducted differently in answering the second research question (section 3.2).

3.1.2.1 Participant observation

In May and June 2014, I visited eight local musical communities, acting as a participant observer in rehearsals. During each visit, I acted as an invited guest to the choir for rehearsal (only for choir #2) or performed with the participants together (for the rest of the visits). I witnessed how people met up, how they engaged with others and activities; how they manipulated music and sheet music and talked to them about their experience, attitudes, and expectations in using relevant new technologies. All the choirs visited have regular agendas for rehearsal, performance and social networking, but differed in their professional levels, the objective of performance, size, and the age range of members. Table 3-1 presents detailed characteristics of the visited choirs. Choir #1 - #3 were referred as *formal community choirs*, which required audition as an entry requirement. These choirs mainly arranged rehearsals for performances that mainly took place in concert halls, chapels, and churches. Choral works used in formal choirs were demanding and complex. Formal choirs usually did not have firm requirement of the age of its members, and therefore usually included a mixed-age population. Choir #4 - #8 were referred as informal community choirs. These choirs encouraged the general public to join for leisure and socialisation; usually, these choirs did not require auditions. Music rehearsed in the visited informal choirs mainly included folk, pop, and rock music. To fit the levels of music expertise of their singers, chorus works of informal choirs were often edited to homophonic[21] versions. This type of choral music structure created a simple but effective vocal space of chords.

Table 3-1 Participant observation implementation

Choir	Scale	Age Range	Frequency of Rehearsal	Visits (hours)	Type
#1	90	Mixed	6 per year	7.5	Formal community choirs
#2	16-20	Mixed	10 per year	8	
#3	30	Older	10 per year	2	

[21] In music, homophony is a texture in which a primary part is accompanied by additional parts (usually flesh out the harmony) in the same rhythm of melody. See https://en.wikipedia.org/wiki/Homophony

Choir	Scale	Age Range	Frequency of Rehearsal	Visits (hours)	Type
#4	20	Mixed	3-4 per year	2	Informal community choirs
#5	20	Older	None	6	
#6	10	Younger	2-3 per year	2	
#7	50	Mixed	3-4 per year	3	
#8	90	Older	3-4 per year	2	

3.1.2.2 Diary-aided interview

Drawing on what had been found from the participant observation, we designed a diary study and an interview study to further explore meaningful participation and the use of technology. The diary-aided interviews were conducted during January – July 2015. An advertisement was distributed among community choir members living in Cambridge, UK. At the end of the interview, participants were thanked and given a CD of choral music for taking part.

Since December 2014, prior to the diary-aided interviews, we built rapport and trust with participants via in-person meetings, and in many cases joining the group rehearsals and singing with them for one or two weeks. A screening survey was distributed when recruiting participants for the diary-aided interview. In the screening survey, we asked 3 questions about participants' social identification and 4 questions about their competences in community participation using 5-point Likert scales (see Appendix A). Sample questions of social identification included "I feel like I belong in my music communities" and "I feel loyal to the people in my music communities". Sample questions of competence in participation included "I know how to get in touch with members of my music communities when I need to" and "I volunteer time to work for the music community". Data from the screening survey was later used to interpret the qualitative data.

Diary studies have high "ecological value" (Czerwinski, Horvitz, & Wilhite, 2004) by providing rich contextual insights *in situ*. However, diary studies may potentially add to the "interruption of the daily events" (Czerwinski et al., 2004) due to the tedious character of completion of diary entries. To balance the task burden and richness of data, during the first

six days we asked participants to write down their "notable music moments" three times a day – in the morning, in the afternoon, and in the evening. For each time point, participants were asked to indicate what technology had been used, what tasks they had performed (e.g., details of music and events), and the context in which the notable music moments had occurred (e.g., when, where, and with whom this moment took place). Data from the first six days was used for section 3.1.

Beyond analysing the diary logs, we wished to capture community musicians' mental model of their relationship with the inter-connected technological devices and artefacts in relation to music. In this regard, the task on the seventh day was a drawing task, in which the participants were asked to draw a "social diagram" regarding all their social connections related to music, and in what way they were connected. Data drawing from this task is not the focus of this research question and will be used for answering research question 2 (section 3.2).

Participants who completed the diary study were then invited to the research lab for a 60-min semi-structured interview on their experience of community music participation, and how they use, appropriate and perceive digital music technologies and information technologies in general. Participants were first asked to explain their social diagrams and the reasons behind them. We asked who the people or organisations were, how the mentioned technologies were used, and how the social diagram developed over time. We also encouraged participants to talk about how they manipulated and experienced music in offline settings (such as radios, vinyl, and CDs) and to compare these experiences with their use of digital music technologies. Participants' life course experience (e.g., retirement, growing old, other significant life events in later midlife and old age) were explored during the interview. We also examined "extraordinary socio-technical events" (e.g., a newly acquired technical device, joining or leaving a community group) during the interview, to get a fresh perspective on participants' situations. All interviews were conducted in person and audio-recorded.

3.1.2.3 Participants

Thirty-three people signed up for the diary-aided interview study and completed the screening questionnaire, after which 13 people completed the diary. Eventually, 11 of these participated in the interview: 3 men and 8 women with ages ranging from 50 to 71, from Cambridge. They had been recruited via connections of the research team, distribution of posters and flyers, and the mailing lists of local community choirs. The interview participants had diverse backgrounds of employment status: in employment, semi-retired (taking on one or several part-time jobs while being retired from a full-time job), and fully retired (from one month to ten years). Almost all retired participants left their full-time jobs around the age of 60; some of them started part-time or voluntary jobs afterwards. A detailed description of years of retirement/semi-retirement is provided in Table 3-2[22]. Among all the participants, P05 and P10 regarded themselves as "retired" when filling the screening questionnaire. However, during the interview, they indicated explicitly that they were actively participating in part-time work and actually regarded themselves as "semi-retired". From Table 3-2 we also noted that age and whether a participant is retired or semi-retired is not correlated. A 61-year-old participant was retired, but a 71-year-old were still semi-retired. There was no overlap of participants between the participant observation and the diary-aided interview.

Our participants had diverse educational backgrounds and jobs (including music-related as well as unrelated jobs). Two of them had the experience of leading a choir, teaching and conducting music. Recruiting both community music leaders/conductors and members gave us insights into the diverse strata of this community, and how digital music technologies were used and perceived in different contexts. Importantly, six of them had used some types of digital music services (e.g., BBC iPlayer, iTunes, SoundCloud, Spotify). The other five were asked to experiment with such services during the interview in order to capture their initial reactions.

[22] P01-P11 were among the 13 participants who participated in the diary study and completed the interview. P12 was the participant that I talked to in the participant observation, and P12 did not participate in the diary study nor the interview. Therefore, the demographics of P12 is not included in Table 3-2.

Table 3-2 – Demographics of diary-aided interview participants

P#	Age	Employment status	Music experiences	Employment experiences
01	M(64)	Semi-retired	Singing in a local informal choir, attending workshops sometimes	Doing part-time work
02	F(61)	Retired	Participating in one informal choir and a formal choir, attending workshops sometimes	-
03	F(67)	Retired	Singing in two informal choirs and one formal choir, used to be a teaching assistant of music classes	Retired 5 years ago. Should have retired at the age of 60, but postponed it because her husband was still working
04	F(71)	Retired	Singing in a formal choir, used to be the head of music in a primary school	Retired 11 years ago. Before retirement, the music she did was rarely dependent upon technology.
05	M(66)	Retired /semi-retired	Singing in four formal choirs	Retired 1 month ago, but was still doing some teaching
06	F(71)	Semi-retired	Singing in five formal choirs, singing as soloist in two choirs, violin player	Still teaching and doing research in a university.
07	F(62)	Semi-retired	Singing in one informal choir	Regarded herself as not retired as she worked more than before: having been working with the school and teacher association for years; recently working for an education scheme in the summer.
08	M(71)	Retired	Previous church musician, choir singer in one formal choir, attending workshops sometimes	Took a year off for a MA degree at the age of 50 to learn new things and how to use the computer. Started a company after retiring from the church at the age of 59 and worked full-time for eight years. Then generally stopped working for the company at the age of 67.

P#	Age	Employment status	Music experiences	Employment experiences
09	F(67)	Retired	Singing in two formal choirs	Fully engaged in retirement activities after retirement, almost being occupied from Monday to Friday.
10	F(69)	Retired/semi-retired	Previously sang in seven formal choirs, mainly attending one currently	Regarded herself as semi-retired, as she still did part-time work when she needed to.
11	F(50)	Not retired	Community music practitioner, composer, and conductor	A community music practitioner. Fully engaged in music teaching and administrative work of music groups

3.1.2.4 Analysis

All the diary entries were coded and classified into recurring categories that were derived from reading over other participants' entries. We performed several analyses on the diary log. First, the codes were counted and analysed based on the type of music devices and community music practices. Second, the temporal distribution of the frequency of using music devices and community music practices were analysed and plotted. For each of the statistics, figures were calculated for each participant by day of the week. Frequency data was further collapsed across days to draw an overall picture of how participants use different types of devices to perform different tasks at different time points each day. An overview of diary entries revealed that conventional music listening devices, instruments, as well as technological devices in relation to music, were prevalent among the diary entries.

The audio recorded interviews were all transcribed. All audio-recorded observation sessions and photographs were transcribed as well. Data analysis adopted a grounded theory approach using the constant comparison methods (Corbin & Strauss, 2008). NVivo 11 was used for qualitative analysis. Much of the analysis of interview transcripts was conducted simultaneously with data collection. At first, two researchers (including myself) did the open coding of six transcripts independently, during which memos were written. Then the two researchers iteratively discussed the emergent codes and categories. Examples of initial codes are "being part of a community", "music sharing", and "workshops", which are related to the

higher-level category of "participation in community music". Then I proceeded with coding the remaining interview and diary data, and related new data back to the emergent codes. The primary set of emergent codes were used to iteratively code all the interviews, diary data, and observation field notes again, and newly emergent codes were added into the primary set. After that, axial coding and selective coding were conducted to form themes. Then I returned to all the previously analysed data and investigated them again with the newly formed themes. Finally, emergent themes in terms of their properties, and the structural relationships among themes were generated from data. The diary data and field notes from the participant observation were further compared against and confirmed by the emergent themes from interviews. The emergent themes reported are around practices through participation in community music: *meaningful participation and commitment, the careers of individual community musicians*, *forward-facing identity*, and *temporality and spatiality of music learning*, and the *characteristics of meaningful participation*.

3.1.3 Findings

3.1.3.1 RQ1.1: Why and how are participants "recruited" and "captured" in community music practices?

Why do people participate in community music in late midlife and old age? In our data, two main motivations emerged: for self-development in music and socialisation. All of our participants mentioned that they joined music groups initially because of their interests in music; 45% of participants in particular mentioned the enjoyment of group music-making. Music-related, development-oriented motivations were more common among semi-retired participants compared to those who were retired. In our data, 80% of semi-retired participants mentioned that they participated in community music because they wanted to learn to sing or to become better musicians. On the contrary, only 20% of retired participants mentioned that they were motivated to participate in community music for the reason of self-growth. How community music differed from listening to music or performing by oneself was that community music participation brought social enjoyment:

3.1 Research Question 1: Meaningful Participation in Old Age

> "I was always involved, for example, in musical things and then [I] enjoyed music. But I could never really participate myself." (P08)

How do the practices of community music spread among people and "recruit" new participants? Word-of-mouth was the most common means of diffusion in our data. Unsurprisingly, it was not unusual that individuals simultaneously engaged in many different hobbyist groups other than music. New participants were attracted to and "captured" by community music mainly from their established social networks. This finding resonates with Lazar and Nguyen's work (2017) that older adults always seek companionship before joining activities. Also, it confirms previous research on the emergence of practices, that community music practice "*spread[s] by means of social contagion, moving between people who already knew each other as neighbours and or as friends sharing other interests in common*" (as cited in Shove et al. 2012). As such, socialisation is another, and no less important motivation for participating in community music. In our data, 6 out of 10 participants of community music (4 retired, 2 semi-retired) mentioned that they joined community music for "purely social" reasons. The data showed that more retired participants (80%) were motivated by social reasons to participate in community music than semi-retired participants (20%). This tendency resonates with the purpose of "finding new ways of spending time" (Lindley & Wallace, 2015) in old age. It is noteworthy that all of our interviewed participants had been in music groups for a while (ranging from 5 to over 20 years), meaning that they were no longer "new encounters". Although retrospective, our data concerning their motivations of joining and participating in community music provided some insights on their initial expectations and reasons for continued participation. We proceed with asking what it means to be a committed member of community music participation.

Over time, new community music participants became committed members of their music groups, or what Shove (2012) called "old-hands". In our data, commitment to community music groups was dependent on (i) the comparison between individual motivations and the level of group musical aspiration; (ii) the perception of and reflection on one's physical conditions (e.g., voice, appearance). Here commitment refers to a status with "provisional stability" (Shove, 2007, p. 79), in which our participants tried, selected, and shifted to one or

a few appropriate music groups. We have a few examples of this. For instance, after trying out many music groups of different levels of musical aspiration, P08 finally found the one that he felt most comfortable with.

> "I find that [name of the choir] suits me well. I can't imagine that I have a [more ambitious] choral future in the sense that it's going to get very much better than what I've got, I try to go to as many common things [choirs] as I can." (P08)

P08 was aware of the change he had experienced when shifting from a more advanced choral programme to his current one. He also anticipated that he might experience a further decline in his 70s in chorus singing. What could also be implied here was that the prospect of ageing among healthy older adults could be a triggering force for future role transitions:

> "My choral ambitions will be declining after all that wonderful experience. I am in my 60s now and in my 70s, it would probably be downhill from here […]". (P08)

A relevant observation was that the music groups' websites functioned not only as a hub of information, but also as a presentation of collective identity of the group, which connected the offline and online world of community music. The music instructor of choir #5 (from participant observation) presented much of her work on her personal website and Facebook page. P12[23] in the same choir mentioned that she found community choirs that suited her from the website:

> "You can find the website and choose programmes that are of more relevance to you. This session doesn't have performances. You can try the RA choir, because that choir has more chances to perform!" (P12)

In other cases, voice repertoires and the performance culture played an active role in participants' perception of commitment. As an "expressive human activity" (O'Bryan, 2015) rooted in all cultures, singing has the power of communicating human emotions, needs and

[23] P12 was a participant who was interviewed during our participant observation and contextual enquiry.

meanings. In our data, some participants felt that their voices defined them, and the loss of voice that can accompany the typical ageing process was a source of distress. Three of our participants had experienced this issue. As a result, they had to reconsider their participation in the voice group:

> "And there is a point about 20 years ago, I had cancer treatment, giving therapy actually takes away three notes. [Before the treatment] I was the higher soprano […], and when I went back to [name of the choir], […], I stayed for a year [as an alto]. It [singing as an alto] was an interesting thing to do because [my voice was] in the middle of the massive sound, and I happened to be a bit more on the board about sight-reading – I actually quite enjoyed that. […] then my voice sort of improved and I am the second soprano now." (P10)

For P10, the temporary leave from the soprano part entailed feelings of loss, but also celebration: she experienced growth in her personal musical skills, and this surprisingly improved her self-efficacy with music. In another case, a member in P08's choir left the group because of the decreased self-efficacy with music, but re-joined as a special audience. Feelings of anxiety and guilt over not being as competent as others were cited as participants' primary reason for exiting the music groups. However, the consequences of defection from participation were not completely negative. These participants celebrated their exit as the start of another status with another hobby (e.g., involvement in taking care of guide dogs) or a family-focused lifestyle. Additionally, P10 discussed her mixed feelings about the mismatch between performers' age and her assumed expectation from the audiences:

> **P10**: That's about 25 years [ago], the opera group that I enjoyed very much, but when I got to (that) 50, I thought, no, it's for younger people, because it's a bit, it's pushing the audiences' expectancy having a (bit) chorus of 17-year-old girls on stage of that. […] I think no. They are for the younger ones….
> **Interviewer**: Did you feel pressure because of that?
> **P10**: No. It was just my feeling about it. And I looked around other people, … We were all pretty old, and you know, when you are supposed to be able to [perform] on the [stage] and get a piece of [performance]… it's embarrassing, and I was still there, but I

> just thought it was appropriate. So, I found [what] I would do to something, something different."

Although this participant further elaborated that it was appropriate to stay because other older people were still in this group, the mismatch of age and the complicated feelings prompted her to shift to another A Capella group, in which members were all of her age. She reflected on the process of ageing with a neutral voice: "*It's feeling natural to progression; one thing happens after another.*"

In answering RQ1.1, we used the concept of "career" (Shove et al., 2012) to unfold why and how late middle-aged and older people participated in community music. The circular "career" of participation included being "recruited" as a new member, being "captured" as a committed member, and the "defection" because of one's reflection on identity and the comparison with groups and other people.

3.1.3.2 RQ1.2: How do people participate in community music?

Unsurprisingly, "absorbing and retaining music" was a significant, ongoing practice for community choirs. In this section, we uncover how people learn music from temporal and spatial dimensions. As sociologist Schatzki (1996) noted, a practice is "*a temporally and spatially dispersed nexus of doings and sayings*". The reconfiguration of meaningful participation in terms of time and space enables us to examine not only what people do for meaningful participation, but also how and when they do so, what it requires for doing, and what the *doing* means for them.

The temporality of music learning. Our data from the participant observation highlighted the different temporal patterns of music learning practices in different music groups. As for formal community choirs, a lifecycle of learning music organised around a "musical term" was marked by the starting of new repertoires and ends with a concert. On the contrary, the informal, social-oriented community choirs had a more flexible and less structured learning mode, which was marked by the process of learning a particular piece of music.

In addition, we noted that printed sheet music was the dominant medium in support of interaction at rehearsal and performance and sometimes played a role in structuring the temporality of music learning. Sheet music used in formal community choirs was usually original copies or copyright-owned printed online scores. In informal choirs where learning music by ear occurred more often, lyric paper was widely used. Lyric paper acted not only as a reminder of music, but also functioned as a temporal cue, documenting repeats, pauses, and turn-taking between voice parts (see Figure 3-1). However, choirs using either form of sheet music may encounter challenges while sharing it. In large choirs, there were always different versions of scores, leading to uniformity problems, since versions may differ in page arrangement or notation. Another challenge was related to the usage and adoption of cloud technologies: sometimes choristers were asked to download and print digital sheet music from a website or cloud storage services. However, not many older participants knew how to download or to use cloud services. For those participants who used cloud technology, then, they lacked a sense of control, and they often attempted to find alternative solutions without using technology.

We then referred to the results of the diary study to understand the individual-level music practices among community musicians. For all of our participants, "radio (in the house or in-car)" was considered a dominant device for daily music practices. Across the six days of the diary study, 47% of the reported music technologies in participants' diaries were related to radio. The next most frequently used music technologies were DVD/CD/MP3 players (27%). Internet-based music technologies counted for 24% among all music technologies, including laptop computers with streaming services (18%), and mobile phones (6%). These data are shown in Figure 3-2(a).

3.1 Research Question 1: Meaningful Participation in Old Age

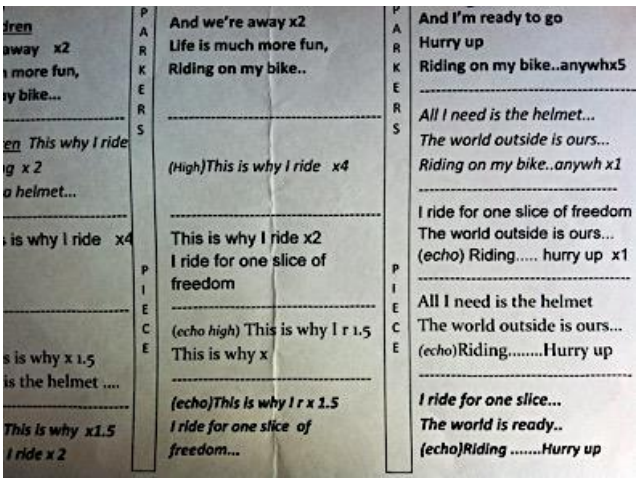

Figure 3-1 Lyric paper used by an informal choir

Next, we analysed the frequencies of device used and different types of practice (see Figure 3-2). We found that the largest category of activity was singing and rehearsal (36%). It was unsurprising because our participants were typical community musicians with routine singing rehearsals. Singing and rehearsal occurred every day. Twenty-seven percent participants reported listening to music. Performance counted for 22% of the reported practices and practicing by oneself counted for 15%. This indicated that 70% of notable music moments were around community music participation among our diary study participants.

To further understand the temporal distribution of technology use and music learning during this week, Figure 3-3 shows the distribution of typical community music practices and device use across six days among all participants. The size of dots represents the number of participants performing certain activities or using specific devices during a day. For the use of the radio, nearly every participant reported using radio for music listening every day. Perhaps more interestingly, more participants tended to use the radio in the morning or in the evening (See Figure 3-3). Music players and personal computers were used almost daily among our participants. From Figure 3-3 we also found that practicing by oneself always took place during evenings and afternoons.

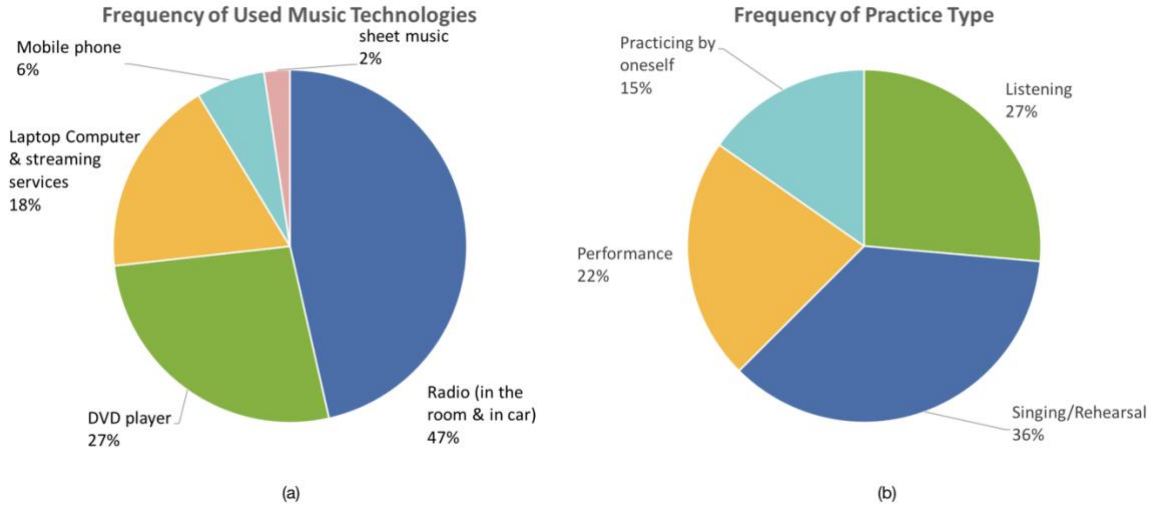

Figure 3-2 Frequency of diary entries for (a) technological devices used, and (b) types of community music practices

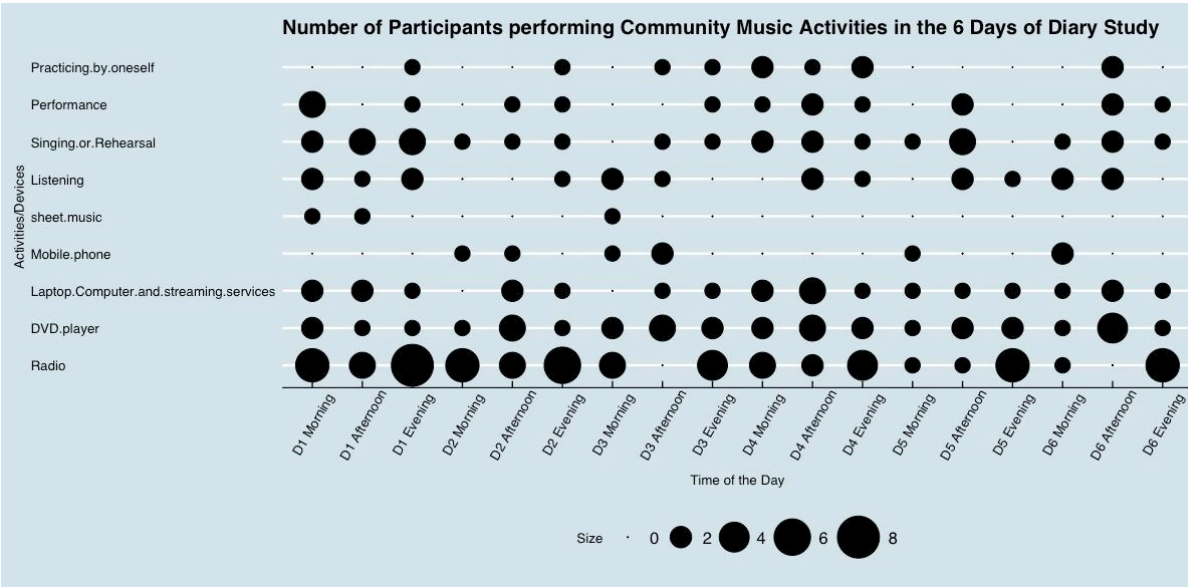

Figure 3-3 Number of participants performing community music activities in the 6 days of diary study

The spatiality of music learning (in the context of music performance). From the perspective of rehearsal and performance, we observed that blending by position made the music learning progress more interesting. We found that different seating arrangements were not only associated with whether the choir was formal or informal but also interacted with

music texture and the progress of learning music. To describe how the seating arrangement differs, we organised our observations according to a model of group formation (see Figure 3-4).

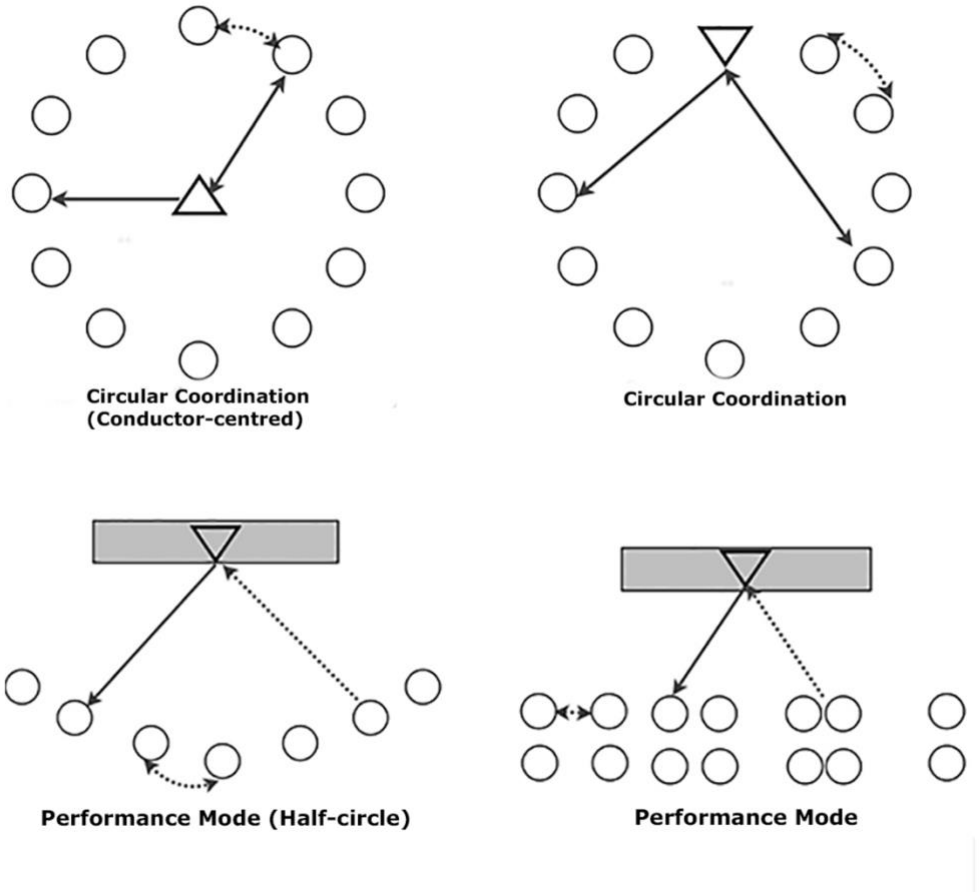

Figure 3-4 Model of social interaction in community music. Solid arrows represent the communication flow between participants (circles) and the conductor (triangle). Dotted lines indicate that the communication flow is limited

Circular coordination. It was common for informal choirs to sit in a circle. Figure 3-5 illustrates the structure of this behaviour by depicting a two-way flow of information between the music teacher and choristers. On the one hand, the music teacher stood either in the middle of or along the circle and tried to make eye contact with each chorister while performing. This phenomenon was found frequently in smaller sized informal choirs and music workshops (such as choir 5 and 7). Participants in these choirs stood shoulder-to-

shoulder, facing inwards, singing homophonic music with each voice part starting either synchronously or with a turn-based manner. This circular seating plan supported coordination among participants and the music teachers, as found in Benford's work on Irish traditional music-making (Benford, Tolmie, Ahmed, Crabtree, & Rodden, 2012). It also improved the experience of homophonic music (Quadros, 2012). For instance, Loch Lomond is an old Scottish folk song, and the homophonic version is easy to learn and sing. Each voice part used a "very similar rhythm", with which "making echo and chords" was "quite fun" (according to one participant in choir#7). The circular coordination let the participants actively engage in discussion of the emotional content of music, which was present in informal choirs like choir#5 and #7. Besides, the circular form facilitated blending people by different voice parts.

Performance mode. Performance mode was common in formal community choirs, and some large informal choirs (e.g., choir#8). Here, the conductor stood in front of the participants. All participants faced outwards to the conductor; each voice part is spatially distinct. Each voice part had its predefined area. The performance mode made it easier for the conductor to see everyone and give background information on a piece to be rehearsed to large choirs. Instead of engaging freely in discussions, the communication flow between participants and conductor was relatively limited in the performance mode and was usually conducted with a question-and-answer mode. Prior research suggests that performance placement is beneficial to polyphonic or antiphonal musical textures, which always exist in repertoires of professional community choirs (Quadros, 2012). In our participant observation data, Hector Berlioz's *Te Deum (Op.22)*, a large antiphonal work, was performed by two semi-independent choirs in interaction. However, learning music through choral singing was not without challenges. With decreasing hearing ability, some older participants sitting in the back rows in a performance mode find it "*difficult to hear what the conductor or choir administrator is saying*". Yet the music played was loud enough to hear. Circular seating plans in informal choirs might address such difficulties.

Music learning in formal and informal groups. In the diary and interview data, we also identified the spatial patterns of music learning in the social context. There is a distinction

between two levels of standard of music aspiration in community music: *formal* groups and *informal groups*. Such difference further formed socio-spatial boundaries of music learning. In formal groups, participants regularly performed choral pieces mainly for a paying audience at formal venues. In informal groups, participants with common interests in music participated in a range of communal music activities mostly for the enjoyment of music. Note that informal group members usually had a relatively lower level of musical aspiration compared to formal music groups, even if some informal music groups performed at formal venues for a paying audience. The difference in part lay in the levels of complexity and texture of choral works.

The distinction between formal and informal groups had implications for the membership and rituals of community music. Drawing upon research about the sense of community, membership of a group is formed from established boundaries, a sense of belonging, and identification (McMillan & Chavis, 1986). Community music groups set boundaries on the basis of the rituals of music – learning music, rehearsing and performing musical pieces, and interacting with audiences. As a result, individuals formed their identifications and shared emotional connections that were specific to the group that they belonged to. For instance, six participants in the interview mentioned their experience of attending workshops – a type of short-term informal music group. The enjoyment of attending informal music groups was often linked to the experiences of being in a new place, having a nice performance venue, meeting new people, and interacting with audiences and other musicians. One of our interviewees described her experience of singing in an informal choir, in which unique performance venues and the shared emotional connections were mentioned:

> "It was such fun! It was lovely to sing on the steps of [name of a museum] and they [the cycling athletes were] all going past […] The sort of social network, its choir leaders, workshop leaders, friends [attracted me most], […] And the leader at the workshop in Letchworth, she is the most well-organised person." (P02)

This contrasted with the formal groups, an example of which came from a participant who had shifted from a formal group (with a higher standard of music aspiration) to an informal one. To him, the ritual of formal music groups was less flexible, as it prevented him from

singing during off-term periods when no rehearsals were scheduled. The higher level of standard of music aspirations at the formal choir resulted in pressure on him.

> "I count my main choir as C [choir], and I feel less stressed, M [choir] was a bit stressful, when I was so new to singing, but there is [not] a lot of pressure on, as I went to a really good performance [in the C choir] – I loved it. But it is[has] less pressure". (P08)

As mentioned before, our participants were able to find the music groups that matched their identities and met their new-found expectations, although in many cases it was merely "provisional stability". Just as P08 found choir M a good one for him to become a better musician in the first place, a more critical need of gaining social interaction and relaxing time drove him to switch to choir C with less demanding musical works. In contrast with informal music groups, the perception of formal music group membership is likely to be associated with more advanced musical skills, a higher level of standard of music aspirations, more nuanced musical performance, in addition to general enjoyment, commitment and social support.

In another case, P09 participated in both formal and informal groups. She found performing in a concert hall as part of a formal choir attractive. Meanwhile, she enjoyed taking part in a less professional and smaller choir:

> "The acoustic [at W choir] when we are singing is not great…[but] I can hold my line and can come with the right note. It helps the other people who don't sing at all, apart from the [name of the choir] which is very ad hoc." (P09)

The way in which P09 compared with and presented herself to other group members had implications for the identification with different patterns of music learning in informal and formal music groups. We have mentioned in the previous section that participants initially participated in community music for music or social related motivations. As the participation continued, some participants became committed members. One's identity was formulated, further enacted and evaluated through continued participation and social interaction with others. In the case of P09, she "develop[ed] her self-worth" (O'Bryan, 2015) in an informal

choir by comparing with and presenting herself in a role that "gave" support to her fellow singers who were not as competent as her. As such, the different music learning pattern in informal groups enabled downward social comparison processes (Wheeler & Miyake, 1992) for participants like P09. The psychological process of downward social comparison, according to social psychology literature, is found to be associated with positive emotions and higher levels of self-esteem (Wheeler & Miyake, 1992).

The findings so far suggest implications for the complex interdependence between meaningful participation in community music, music learning over time and across spaces, and identity development of participants. Our findings also imply that meaningful participation develops on the basis of its participants, related music artefacts, and devices, and more importantly, what it means for people and what it requires. We provided answers to the first research question of this dissertation by differentiating different patterns and dimensions of music learning practices, during which a few characteristics of meaningful participation emerged. We proceed to discuss these key features in the discussion section, so as to set the scene for our next research question (to be elaborated in section 3.2).

3.1.3.3 RQ1.3: Characteristics of meaningful participation

As outlined in the method section, the theoretical framework of social practices (Shove et al., 2012) became apparent as the themes emerged from the data. Drawing on this vein of work, we summarised three key characteristics of meaningful participation: *accumulation of competences*, *collective identity and identification*, and the *distribution of possessions and technological tools*.

3.1.3.3.1 Accumulation of competences

The first characteristic is that *competences* (including knowledge, expertise, and confidence) accumulate with participation. The motivation of self-development in music did exist among all of our participants. The subjective feeling of personal growth through participation was attractive to people, even if the extent to which musical skills or knowledge improvement was not comparable among informal and formal group members. As mentioned before,

participants followed what the music teachers/choir instructors/conductors told them, learned music with sheet music and music MIDI files that were distributed. There was a tendency to follow the more experienced members and becoming a committed member with a higher level of expertise. As such, rather than an "attribute" of participants, competence was achieved through *doing*. In our data, participants generally recognised themselves as "committed members" rather than "observers" when they were more confident in their music expertise:

> "I determined that when I retired, I'd like to learn to sing better. So, it's only [since] last ten years I've been learning to sing. And I found I enjoyed it. I think I could congenially say [singing] to be a life changer… [singing brings me] such much enjoyment. I feel like I know some bits of classical repertoire from the inside, instead of simply just being an observer." (P08)

Another noteworthy implication of this characteristic is that meaningful participation in community music in old age is cumulative. The evidence of the accumulation of competence contributed to this hypothesis regarding the practical knowledge of *doing* and the confidence that follows. In our data, participants with a higher level of music expertise and who participated in formal music groups may decide to take part in informal groups and be selective in their participation patterns. However, for those with a relatively lower level of music expertise, joining formal groups could hardly be a feasible option. We draw upon Bukov et al.'s (2002) theoretical conceptualisation of social participation to discuss this further, that the types of social participation can be distinguished based on the resources that are shared by individuals (Bukov et al., 2002). The core idea in Bukov et al.'s work is that people who participate in more demanding social participation are able to attend the less demanding activities and be selective in activities that are interesting or satisfying (Bukov et al., 2002). To this end, there were a few serious, professional, formal music groups (e.g., choir#2 in our participant observation, formal choirs that required auditions or a minimal number of absences) that can be termed as *productive participation* with the aim of producing "products" (i.e., concerts and performances). Advanced musical skills (e.g., choir#2's requirement of zero mistakes and reciting all the repertoires in performances) and time were

necessary for participation in this type. Also, formal groups that were less demanding (i.e., those that did not require auditions) and informal groups can be categorised as *collective participation*, because they were relatively less demanding in terms of music skills or time. For example, some less demanding formal music groups, however, required participants to devote a certain amount of rehearsal time for the quality of performances, whereas several informal groups (e.g., the community choir that P09 attended) were purely social, since participants could occasionally join without influencing the whole group. As such, this research extended Bukov et al.'s (2002) cumulative hypothesis of social participation by providing a subtler division of collective participation. Unlike social resources that are regarded as relatively stable as people age in Bukov et al.'s study, musical competence may decline with the process of ageing. Also, we drew a more nuanced picture of social participation for active ageing by contributing specific contents on the interplay between selectivity (i.e., socioemotional selectivity theory in the gerontology literature) and accumulation. In particular, our findings elaborated that the selection of social participation took place with a requisite of necessary competences.

3.1.3.3.2 Collective identity and identification

The second characteristic of meaningful participation is *collective identity and identification*. The "communal nature of choir singing" (Quadros, 2012) created a collective identity of the group and "a common flow of feeling" among its participants. We can easily define each community choir; however, it is hard to define an individual singer's identity. As Lave and Wenger (1991) put it: "*the value of participation to the community and the learner lies in becoming part of the community*". In this sense, constructing a collective identity and having membership in community music groups enabled participants' meaningful participation. P04 expressed the "group thing" that made her enjoy community music:

> "…I am fortunate because I am still not a brilliant one [singer]. [But] I like to accompany people. [I] couldn't [play well] when I was young, doing piano solo - that's not me. I like accompanying. It is part of this group things in which I really enjoy." (P04)

Moreover, our findings about the development of "careers" among community music participants underline the importance of identity development in a forward-facing manner. In line with the progress spanning from "new encounters" to "committed members", we argue that identity development in the context of community music entails the *formulation*, *enactment*, and *evaluation* of identities. Just as all participants mentioned their early memories with music and the role of music in motivating them to participate, the *formulation* of music-related identity (e.g., "*I want to be a musician*", "*I want to learn to sing after retirement*") acted as the internal triggering force of participation. When faced with the decision making of which type of community to join and which type of community music to focus on, participants' "possible musical selves" (Creech, Hallam, Varvarigou, Gaunt, et al., 2014) became critical. Personal preferences for music genres, musicians and the atmosphere of music communities were among the top criteria in selecting groups. P03 mentioned: "*I love folk music, and I think I can sing along too. Thus, I chose this choir [name of the choir]*." Additionally, in our data many participants emphasised the importance of keeping busy, staying active, pursuing activities (i.e., group music-making) that were interesting or satisfying to them after retirement. The music here was a medium through which participants could reconnect to their past selves, pursue "a sense of continuity" (Creech, Hallam, Varvarigou, Gaunt, et al., 2014), or embrace future development.

Through participation in a social context, people spent time and energy on engagement and generally shifted their behaviours to group actions that were congruent with the group norms (e.g., rules of rehearsal, focus on particular genres of music repertoire). Drawing on the theoretical conceptualisation of social participation (Bukov et al., 2002), the realisation in group actions (i.e., community music practices) entailed the accumulation of competences. As mentioned before, participants with the requisite practical knowledge and competences were able to participate in more demanding music groups and had more options between informal and formal music group activities. The congruency between group membership and one's self-concept may encourage the participants to become committed members. In this case, group-level actions could, in turn, empower their identification with music communities. We reconnected with our data from the screening survey with respect to the extent to which people identify themselves as part of the music groups and their competences

of participation socially. Correlation analysis showed that the ratings of social identification were positively associated with the competences of community participation ($r = .32, p < .05$), meaning that a higher level of social identification with the group was correlated with a higher level of competences accumulated through participation. This finding, coupled with the qualitative findings on the "careers" of participation, suggests that the realisation in participatory behaviour is associated with the enactment of shared identities (Turner, Oakes, Haslam, & McGarty, 1994). Therefore, our data supports the notion that collective identity could be *enacted* through participation in community music (Abrams & Hogg, 2006).

Through participation, our participants evaluated their collective identities on the basis of *attainability* and *desirability*. For many, they assessed the attainability and desirability by elaborating and strategically constructing their forward-facing identities. Perceived *attainability* influenced the motivating power of forward-facing identities (Schouten, 1991). One of our participants (P10) mentioned her pre-retirement plan of learning the violin, but this did not happen because "*taking up instruments when you are older and with any prospect joining a group to play together is really unrealistic*", and it was unlikely to "*get to a good enough standard to please anybody else*". Age-related health, social and personal resources, and a sense of efficacy would determine the perceived attainability among late middle-aged and older adults. *Desirability* was another evaluation criterion of identification. Schouten (1990) suggests that "approach-avoidance conflict" is engendered when both desirable and undesirable aspects of a single self-concept existed. For example, P06 described herself as a professional musician and had little interests in occasional singing nor informal music groups. However, her opinion was overturned by an informal music-making occasion that she referred as "*a great revolution*":

> "I used to be very nervous, performing…I did an opera thing occasionally when somebody asked me to… it was something like that some social occasion anyway, in somebody's house. And then people wanted to sing just things on folk songs, pop songs and things like that. There were around 20 people, and most were elderly. I played the piano. Although I couldn't remember it because halfway through this, I feel [myself]very enjoying this, completely amazed. So, I say 'Oh maybe I could do [occasional singing]

> more often'. So that was a great revolution. Because it was [with] a good friend, and I assumed that it was very informal and occasional. I obviously was less nervous." (P06)

Formulation, enactment, and evaluation of identity were not temporally ordered. Instead, there was a logical progression of how identity developed: identity formulated based on past experiences, prevalent practices, and future expectations; people further enacted their identities through participation; identities were evaluated based on attainability and desirability. Such progression entailed recurring role transitions and shifting levels of commitment (Moreland & Levine, 1982) in a forward-facing manner. In line with the notion of symbolic interactionism of Blumer (1986), in our study, the possessions of music and technological tools acted as symbols of identity with which participants elaborated self-concepts. This observation led us to the third characteristics of meaningful participation.

3.1.3.3.3 The distribution of possessions and technological tools

The third characteristic of meaningful participation is concerned with the *distribution of things* – possessions of music, sheet music and technological tools surrounding community music. Data from the participant observation, the diary study, and the interviews suggested that meaningful participation was dependent on a wide range of things. An explanation, as outlined by Csikszentmihalyi and Rochberg-Halton (1981), is that the ownership of music possessions allows people to maintain relationships, express self-related information in relationships. When connecting to the cumulative nature of participation and the forward-facing identity, as identified before, we noted that participants distributed and managed possessions to sustain practices, maintaining relationships, and structuring future-facing selves. Among the many forms of things, participants strategically managed their music collections and conventional music listening devices (e.g., radios, PCs). For example, P08 mentioned that he "*has got more than enough [music]to keep [him] going for the rest of his life*". For him, music possessions structured his future-facing self. In another case, P06, a semi-retired, 71-year-old female, kept the physical music collections related to choral singing and would like to buy more when needed, as choral singing was a major part of her current life. Whilst at the same time, she had been thinking of giving away a large collection of CDs

and vinyl left by her father, as "*it is not [her] taste of music*". Her wish to have more choral music collections rather than retaining music from her father demonstrated her current and future-facing identity tied to community music and the willingness to spend time and money on music consumption. In addition, 3 participants reported receiving and giving CDs as gifts upon retirement and were thinking of giving some of their CDs away after retirement. Here we saw that our participants acquired, managed, and discarded things to sustain their current and prospective practices. Moreover, their present possessions and practices were of immediate relevance for their forward-facing self-concepts and may "induce new practices" (Shove, 2007, p. 34) and engender "new ways of spending time" (Lindley & Wallace, 2015).

Moreover, a few participants referred to streaming services and cloud technologies as useful constituents of their meaningful participation in community music. We found many examples that our participants' meaningful participation and identity development were dependent on technological tools. For many, e-mails, online calendars, and group websites enabled information sharing and supported communication needs within and across groups. In the meantime, technologies such as group websites entailed symbolic meanings by representing the group's image and reinforcing self-concepts among its members and potential audiences. Moreover, we noted that music streaming technologies fit into an existing network of already familiar possessions and tools (see Shove, 2007) around community music practices. For example, in the participant observation, participants occasionally recorded their rehearsals with their smartphones and later shared the recordings with group members via Dropbox. All interviewees mentioned that it was common to receive emails from group instructors with YouTube links of music attached. As such, the YouTube links were "introduced" to participants through their prevalent, already-defined community music practices before the future-oriented visions became fully clear. In other words, as streaming technologies were introduced, participants needed to make sense of, adopt and use them in their meaningful and "intended" ways. This is in line with Shove's (2007) notion on the consumptions of products, that "*consumption is organised in terms of past, present and future practice*" (p. 37).

3.1.4 Discussion: Seeing music learning through the lens of social practice

We see music learning as a social practice because it meets three critical features of practice (see Shove, 2007). First, community music participants were "captured, enlisted" (Shove et al., 2012) in learning practices and engaged in music learning actively. It is not possible to maintain a music group without participants. Second, the practice of music learning is "*defined, constituted, reproduced, and reconfigured through participation*" (Shove, 2007, p. 72). In our findings, meaningful participation was configured from temporal and spatial dimensions, as well as different learning patterns occurring in informal and formal music groups. It is through the successive moments of participation (or so-called performance, see section 2.4) that competences are accumulated, identities are formulated, enacted, and evaluated. Third, the music learning practice entailed an evolving network of music instructors, music group members, technological tools, music possessions, competences, self-concepts, and motivations. What participants did and intended to do prompted the reconfiguration of constituent elements of practices and the changes in their temporal and spatial settings. This is essential to set the scene for section 3.2, in which we adopt the "elemental approach" of Shove's (2007) to analyse the role that digital music technologies play in participants' meaningful participation and how emergent practices develop.

3.1.5 Summary

In writing about meaningful participation of community music we have concentrated more on the commitment to groups, the temporal and spatial dimensions of participation, than on the way in which technology use is associated with meaningful participation. Themes with respect to the distribution of possessions and technological tools and identity development have been implicitly mentioned in the characteristics of meaningful participation. A cross-cutting theme, the *situated use of technology*, emerged through the analysis and became significant in shaping meaningful participation and identity development. We put that as the focus of research question 2 of this dissertation.

3.2 Research Question 2: The Situated Use of Digital Music Technologies

This section set out to answer the second research question in this dissertation: **How is situated use of technology associated with meaningful participation?**

3.2.1 Background

Research question 2 focusses mainly on the situated use of technology around meaningful participation and what it means for late middle-aged and older people. In particular, we draw upon Suchman et al.'s (1999) theoretical reconstruction of technologies as social practices and apply the "elemental approach" of the social practice theory (Shove et al., 2012) to unpack the situated use of technology around meaningful participation, how and why people use technology, and how technology use is associated with identity development and psychological well-being. With these findings, we proceed to discuss how emergent practices develop and elaborate on the use of digital music technologies through the theoretical lens of social practices.

This research question is motivated by an exploratory enquiry into the role that digital music technologies play in the meaningful participation of community music and tensions that might arise, as well as a theoretical motivation of extending the adoption path of digital music technologies from the lenses of situated action and social practice theory. We ask the following sub-questions:

- **RQ2.1: What is the situated use of technology for meaningful participation?**
- **RQ2.2: How is identity development associated with the situated use of technology?**

3.2.2 Method and analysis

Findings in section 3.2 were mainly drawn from the social diagram task in the diary study and the semi-structured interviews. In terms of the social diagram task, here participants may write down the names of their connections in the choir, family, and acquaintances. For

example, Figure 3-5 shows a reproduced social diagram drawn by a participant attending community music. This participant wrote "Me" in the centre of the diagram and connected herself with communities that she was in via musical instruments and sheet music. Some participants wrote or drew music-related technologies such as radio, laptops, and MP3s that were used for maintaining their social network of music. The diary study spanned from January to July 2015, so as to eliminate the effect that during a specific period there are too many or too few musical events.

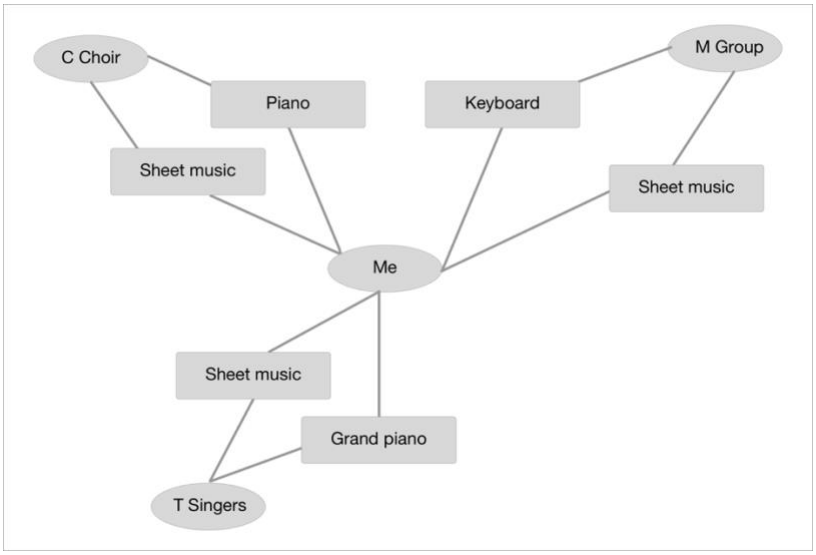

Figure 3-5 A reproduced social diagram from one participant

Transcribed interviews were analysed with a focus on how emergent practices around technology developed, how and when technologies were used, and why participants used technologies in their particular ways. The emergent themes included: *music learning by sharing*, *music revisiting*, *forward-facing identity*, *exercising control*, *role transitions*, and *community music as a social space*. The two recurring themes, *community music as a social space* and *forward-facing identity*, were compared against findings from section 3.1 and were further discussed with specific reference to the situated use of technology. As data analysis developed, it became apparent that the conceptual framework of social practice theory raised by Shove et al. (2012) was a good fit for organising the emergent themes. Therefore, we used

it as a "useful theoretical lens" in our data and further investigated the theoretical saturation of our findings in the discussion section.

3.2.3 Findings

3.2.3.1 RQ2.1: What is the situated use of technology for meaningful participation?

3.2.3.1.1 Sharing as a learning practice

In the context of community music, *sharing* recorded music files to the choir was an essential tactic for choir instructors to facilitate music teaching/learning, rehearsal, and performance. In accordance with findings in section 3.1, 9 out of 10 interviewed participants of community music were aware of the music recordings, links of music, MP3 files, and sheet music that were distributed by the choir leaders/instructors and used them at different levels. The practice of sharing was dependent on an "ecology of goods" (Pantzar & Sundell-Neiminen, 2003) – music possessions and technologies – as well as a network of "sharers" and "recipients".

Usually, music instructors played a role as distributors; participants acted as recipients and content producers. Sharing practices initiated by music instructors often occurred in 'off-rehearsal' situations - not during rehearsals or performance but after or before that- so that participants could learn the pieces with shared recordings by themselves or in small groups or other casual occasions (e.g., party, social gathering). Music instructors recorded music and shared the recordings with the choir via e-mail or burned CDs. The overwhelming use of e-mail for sharing corroborates earlier literature that social sharing practices through YouTube among older people are mainly relying on e-mails. As a choir instructor put it, sometimes "*with the choirs, I [the choir instructor] bring my recorder, and I record some songs, and later I can burn them to CDs for people*" (P11). Aside from e-mails and CDs, posting on websites owned or managed by choir instructors was another way of sharing. In the interview data as well as observational findings, choir instructors reported uploading music to their

websites or cloud storage/streaming platforms (e.g., Dropbox, SoundCloud). Some music instructors ran e-mail discussion groups with music teachers to share information, music, and experiences of teaching. Moreover, choral music websites run by third-party institutions were also popular among our participants. Three of our participants mentioned their use of ChoraLine – a choral music resource hub that enabled community musicians to share and receive information and get support from choir leaders (see Figure 3-6).

Occasionally group participants who had skills or technical facilities for recording music took up the role of recording music, and choir instructors helped with the distribution:

> "Somebody [one of the choir members] records the session every week, and I [the choir instructor] put it onto Dropbox..." (P11)
> "We got a choir member who used to work for the BBC (actually) as a recording technician, and he is recording all the music on our concerts when we first began in twenty (something) years ago. So, we've got a huge collection... They are in CD form, and it is limited just to our usage…. We joined with other choirs, and they have a big mass choir. And [the choir leader] put those songs on Dropbox, so we can access them, and learn the songs. Because we don't actually learn them in classes, we do it by ourselves at home. And then we get together for a couple of weeks, or sessions, before our performance, [and] go through them." (P03)

How do participants perceive and use shared digital recordings? Not all participants thought the recordings were useful. Three participants who were members of formal music groups explicitly mentioned that they ignored those recordings because they were too simple or "*sound weird*". In particular, those who can play instruments (e.g., piano) found learning new vocal lines while playing the piano was more straightforward, compared to listening to shared recordings on the computers.

> "I ignored them [recordings from websites such as ChoraLine]. Well, I just think there is a website that you can go to, and I just don't use it, because I found it so much easier sitting down at a piano, with the music in front of me, I can check what I want to check, and if it is a difficult bit, I could then immediately go to that bit and do it again. Sometimes I would play five times to make sure it moves into my head." (P09)

In contrast, shared music recordings were perceived as helpful among those who cannot play instruments or had problems seeing or reading sheet music. Participant 08 seldom downloaded music from ChoraLine but preferred buying burned CDs. He mentioned his casual music practicing with two other Basses in his choir to go through the pieces they were learning. Before getting the recordings ready for the small group practice, he had to go through a few steps to transfer music between different devices:

> "I was able to download his [the name of a choir instructor who had a website "Learn Choral Music[24]" with the similar functions as ChoraLine] MIDI files, and put them onto a CD by myself, and put it into my MacBook Air, you know, you can put things onto [the computer] as MP3 files, and I put that files on memory disks. Because one of my colleagues is blind, or pretty nearly about blind, and he can only use MP3 files." (P08)

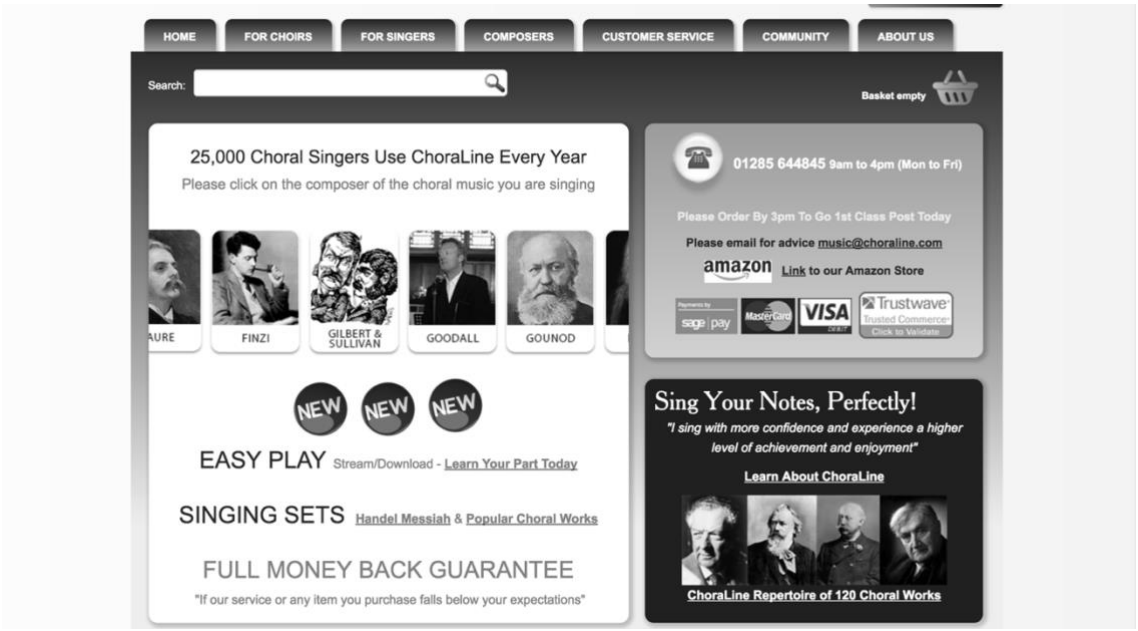

Figure 3-6 A screenshot of www.choraline.com

Over time some accumulated recordings became possessions with reminiscence functions. Shared recordings were not only perceived as useful for sustaining learning and helping with the improvement in competences, but also brought enjoyment and shared memories. P02 kept

[24] http://www.learnchoralmusic.co.uk/

a habit of saving most of the recordings of performances and rehearsals, as "*it is part of our life*":

> "On Saturday we sit down and [listen to] MP3 [of music that we have learnt] by now. And then we practice, and then I saved it [the recorded rehearsals] on the laptop…. I actually save my music file section on my laptop, which I am proud of. They are all there, you just need to [save them] because when [we] did a concert in December in [name of a cathedral], and we were singing songs that we learnt from another one [choir] in summer […] Yes, I keep them. I actually save them." (P02)

Sharing music for reminiscence among participants occurred face-to-face, and included talking about the experiences, browsing the recordings together, and revisiting them in groups. For example, participant 07 mentioned her music sharing with her daughter, and participant 03 expressed the enjoyment of learning music together by sharing the recordings with other choir participants:

> "She [the daughter of P07] has to look up my files and what we do and listen to [recordings from the choir]. She doesn't always agree with the arrangements." (P07)
> "We were learning songs all the time, and some people recorded them right to the end when we went through what we've learnt. On the last night, we went through what songs we have learnt in the two weeks. It was really lovely, really nice." (P03)

The different patterns of music learning (i.e., informal and formal music groups, see section 3.1) in part accounted for the differences in perceiving and using shared music recordings. In particular, formal music group members or those with a higher level of musical expertise tended to perceive shared music recordings as less useful. However, we would lose the subtleties of the whole picture if we stop here. The "complex assemblies" (see Shove, 2007) of music and various technologies and confidence associated told another part of the story. As we have noted in P08's case, music sharing comprised an effective and efficient sequence of multiple performances[25] such as downloading, searching, e-mailing, playing, copying and

[25] Here we mean "practice-as-performance", see section 2.4 for the definition.

transferring. Technological tools played a *coordinative* role: personal computers (and other devices) were used for storing and retrieving digital music, getting access to repositories for resources, as the media through which music was reproduced and transferred, and also as "sound amplifiers" (Leong & Wright, 2013) for individual or group music-making. The situated use of technology was a consequence of the fact that technologies fit into an "existing network of already familiar equipment" (Shove, 2007, p. 78).

Meanwhile, digital music files and technological devices should have the capacity for quick "mutual adjustment" and "synchronised adaptation" (Shove et al., 2012, p. 86) such that sharing can be reproduced and sustained. Occasions that required adaptation included technological innovations (e.g., cloud storage and streaming services were introduced to community music participants by their music instructors), the accumulation of music competences, and the accretion of technological knowledge. Failing to link music-technology complexes to competence may impede the legitimisation of technology uptake and subsequently discourage people to share. For example, even participants who utilise the shared recordings frequently or who value the shared recordings mentioned that they faced challenges whenever they manipulated or played the digital files on their personal computers.

> "You can't do that [playing a difficult bit many times] so much on ChoraLine, God knows, you will have to press the go and backwards button and then you wouldn't go back to what exactly you want to go to." (P09)
> "I don't tend to [share music online or downloading music]. [I] don't have the confidence now. … and I don't have to [do so] …" (P02)

In summary, sharing music recordings in support of meaningful participation was dependent on a complex assembly of music and technologies. Technologies played many different roles under the umbrella of *coordination* in support of music learning. The situated use of technology surrounding music sharing entailed a dynamic, co-dependent relation between sharing-related performances[26], technological tools, and competences. In particular, as

[26] Here "performance" refers to performance in the social practice theory. See section 2.4 for the detailed definition.

individuals' competences accumulated, this had the potential to transform the way in which music was shared and prompt the acquisition and adoption of new technologies.

3.2.3.1.2 Revisiting, learning, and managing

Another prevalent practice in relation to the situated use of technology was *revisiting* what people already have. In some cases, participants revisited music that was shared with them by others (e.g., shared recordings from their music instructors), therefore making it hard to tear apart *revisiting* and *sharing*. In the interviews, we asked the participants to reflect on their digital and physical music collections, how they collected, used, and managed their music collections, and the reasons for using these. We found that the revisiting practice was prompted by different occasions such as learning music in different variations, the intentions of organising, replacing and discarding old collections of music, acquiring new music, and upgrading and reconfiguring existing technological devices. What the various occasions have in common is that participants have to deal with music possessions and a variety of technological tools by negotiating the interdependence among what they have, what they are doing, their competence and openness to learn to use technologies, and forward-facing self-concepts.

One of the occasions, *revisiting* for learning, was prevalent among all of our participants. *Revisiting* for learning entailed proactively acquiring new music, in addition to receiving shared music, as discussed in the previous section. The diary study data (see section 3.1) showed that all participants reported learning music in the performance repertoire at least once during the week of completing the diary book. Among our interviewed participants, 7 of the 11 mentioned buying new music (mainly CDs) for learning purposes. Three participants (P06, P08, P09) explicitly reported that they purchased music that they were about to sing or perform. They usually got a brief idea of what to buy from the performance repertoires of the group or recommendations from community music connections. Two participants (P05 and P07) mentioned other sources of information for buying CDs: inspirations from radio programmes, the serendipity of interesting albums found in local music shops, and personal interests of music. A general observation was that purchasing new music among our

participants was often prompted by goals and expectations in relation to current meaningful participation.

Moreover, buying CDs was not the only way of keeping up with learning and revisiting. Two participants (P04, P05) mentioned that they were less likely to purchase CDs partly because of the "*readiness*" of using streaming technologies (e.g., YouTube, Spotify).

> "Hmm CDs, I buy them less and less, and I think that is partly because of my new sort of readiness to use YouTube, because very often I can get to hear what I want, and I don't have to buy it [CDs]." (P04)

For some, *revisiting* supported learning in a way that participants were able to grasp the subtleties of the music. Two participants (P04, P05) with a relatively higher level of music expertise reported this. As P05 put it:

> "Sometimes I consciously want to retain a number of the recordings. [I'd] go [through] every variation, probably six recordings. And I do have a favourite, but I play the others from time to time. Because there are different interpretations, but as I said earlier, Spotify enables me to do that." (P05)

Participant 04 talked about similar experiences of learning from different versions of music on YouTube, and she developed her own strategies for differentiating high-standard recordings from the overwhelming search results. Indicators of the standard included the performance venue, the names of performing groups, as well as the age of performers (if available in the snapshot). Participant 04 only deemed performances in well-known venues and by trustworthy orchestras of high standard:

> "Sometimes you can get a clue perhaps as the place that they are singing from: if this is somebody who is singing from Vienna or Paris, it is much more likely to be of higher standard, because they've got so much competition. Whereas If it is somewhere in the middle of nowhere, it is more likely to be a local person who is really proud of what they are doing, but [the quality of the music is] perhaps not very good" (P04)

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> "All sort of [music on YouTube] has been done by very bright young kids who made enormous progress technically, but they haven't got any music in them at all. [These recordings] lack musical expression." (P04)

Alternatively, *revisiting* occurred when participants were facing the needs to downsize and deciding which music collections were to retain/discard. Sometimes such situations were prompted by retirement, moving home, or technology innovation, e.g., upgrading music storage/playing technologies. Selecting and getting rid of music possessions was mentally difficult and sometimes painful because our participants' music possessions were "anchored in the past" and with strong emotional attachment:

> "… Actually, some of the strong bits of musical memories connected with my [music] records. … And I was very sad to have to get rid of them, because they will pass away, you know, everybody moves on to tapes and then it all moved on to CDs and so on, and each time you think, 'well, I had it all', and listen, because everything was very cumbersome, and took so much space,…, so like everybody else I got rid of them, but actually I found they would have very strong memories" (P04)

As mentioned before, participant 05 kept many variations of music collections. He had retired one month before the time of interview and was moving books and documents from his previous office to his home. Accordingly, he had to negotiate with his wife about making room for the stuff stored in his office: "we are *reaching the point that we couldn't fit any more in the space [at home], [and] we have to start selecting"*. One tactic of doing so was to downsize the music collection - transferring music on CDs to minidisks to save more space without losing the music. During downsizing, he was "*forced to listen to everything that [he has] got ... because of comparing*". In the meantime, he found streaming music technologies (i.e., Spotify) useful for retaining music while avoiding the long and tedious process of transferring music between devices. In this case, the potential of Spotify was accurately perceived – a large online repository of music collections that would be sufficient to cover his own physical collections. Also, the affordance of music streaming services could potentially mitigate the mental burden of "relinquished" music collections, much as Lindley and Wallace (2015) suggest that technologies may be able to support the saving and presentation of the

memory of "relinquished possessions", and perhaps provide older people with a "ticket to talk" (Sacks, 1992).

Participant 05 reported another case in which he fixed the problem of connecting his old (but still good) sound system to his streaming devices. He reconfigured the old and new technologies to his existing practices of music, such that the independent musical 'selves' of enjoying a massive music resource and also high-quality sound systems were effectively maintained.

> "I've got Spotify there and then the Sonos, [but] I can't use it now. What it does is that it controls the speakers in my house through which I can stream Spotify or radio to the speaker. It [the Sonos] has a unit, which allows me to stream [music from Spotify], and [recently] it is saying "I can't find the system". I think it [the Sonos] is a wonderful thing. In my living room, I have another thing, which is called the Gramofon: it is a little box plugged into my amplifier, and that allows me to stream through my old 30-year-old sound system. I felt that the Sonos had a nice sound, but not really [as] the quality [of] the old system. Now someone told me about the little thing, which costs about 40 pounds. You just plug it into the back and then, you are using your own system with the quality of the old system, fantastic!" (P05)

The above examples of *revisiting* pointed to a recurring theme that new technologies (e.g., streaming services) were contingent on existing community music practices. Situational factors and future-facing identities prompted the practices of *revisiting* and related practices such as acquiring new music and learning to use new technologies. The ownership of new technological tools may engender new expectations, and further reconfigured existing practices, such as the adoption and use of new technologies for meaningful participation. In the case of P05, some of his music consumption transformed to digital formats while the rest was highly dependent on the conventional devices (e.g., the old sound system). He managed to keep *having* and *doing* (Shove, 2007) in "provisional stability" by actively adapting his routine of music to the expectations of benefiting from and the competence of using streaming technologies. The uptake of music streaming technologies was legitimated through

an enduring connection between revisiting music collections, forward-facing identities, and competence with such technologies.

With the findings so far, we underpin three general observations about the situated use of technology surrounding meaningful participation. First, *sharing* and *revisiting* practices encompassed a range of music possessions and technological tools. Likewise, updated forms of these practices emerged and evolved through reconfiguring the connection between technological tools, competence, and self-concepts. The examples of negotiating new spaces and upgrading technological devices contextualised the reconfiguration of spatial and temporal arrangements. Second, technological tools for storing, managing, playing, and transferring music played a *coordinating* role in enacting the practices of *revisiting* and *sharing*. The management of data – digital music collections as well as performance programmes and photos from community music events – involved endless micro-coordination tasks. Lastly, the situated use of technology and learning practices interacted with each other, and it is through mutual adaptation that these practices could evolve meaningfully. The situated use of technology entails a dynamic relation among technological tools, music possessions, technological skills, and confidence, as well as future-facing identities.

3.2.3.2 RQ2.2: How is identity development associated with the situated use of technology?

We have noted in the last section that technology played a *coordinating* role in enacting community music practices in support of meaningful participation, through which late middle-aged and older people engaged and constructed social relationships. Drawing on the elemental approach of social practice theory, we treated the practice as the central unit of enquiry (Shove, 2007, p. 70). In this section, we zoom in on the individual level and discuss how identity development is associated with the situated use of technology. The central themes that emerged are: *exercising control*, *supporting role transitions*, *community music as social spaces*, and *tensions in identity management online*.

3.2.3.2.1 Exercising Control

Exercising control and self-growth goals. The theme of *exercising control* first emerged in the course of the interview with P08 when he talked about how he transferred technical knowledge from a different domain in support of meaningful engagement in community music. He used a master's-level course and a three-month sabbatical in his 50s to learn to use technologies. These technical skills further proved beneficial in helping him find information, search for activities, learn music using online resources, stay connected with friends/family and music group members, and develop a sophisticated judgement of the authenticity of information on social media. He "*now use[d] a computer quite a lot" and had "access to a lot of things that he has never ever thought [he] would have before*". For him, the desire to improve his technical skills reflected his need for self-growth. His use of ICTs was perceived as a means of exercising control over his life at the age of 50 by continually learning new knowledge. His technical skills accumulated from the master's-level course were somehow "standardised", spread, and reproduced into active music participation.

Exercising control by transferring technical knowledge to meaningful participation also applied to non-musical activities. Participant 04 actively explored various new experiences after retirement, and started taking classes at the University of the Third Age (U3A) and joining interest-based clubs 2 years after her retirement:

> "While I was working, I didn't have any spare time to play around. Consequently, the music I did was very rarely to do with technology. While I had retired, and there was more time to make mistakes and probably got it right again. That was really when I started to follow other people…" (P04)

In a French reading group at the U3A, P04 used a simple tapping move that she had learnt from friends to navigate a Kindle dictionary during reading successfully. For her, this was the main reason that drove her to use Kindle:

> "When I go for my French group, it was said why would I need a Kindle and use that. [My friends suggested that] because you can get French coming up straight onto the

> screen. So yes, I've got that as well … [Other people in the group] have been writing down [translations] in pencil on their books and it was [why] they can't remember. … I just tap them [words that I do not know] on [the screen]. It is great! But I think actually it helps me to increase my vocabulary faster than if I would sit to take my notes in that book." (P04)

From the cases of participant 04 and 08, participants' technical skills helped them improve the effectiveness in achieving self-development goals and enjoying meaningful participation. New technologies extended the range of what participants were able to do, by "redistributing" the competences between them and their technological tools (see Shove, 2007). For P04, although in this case not about music, the use of Kindle eased the cognitive burden of trying to remember every French word and taking notes on a paper-based book. As such, this participant was able to experience the joy of reading French without being disturbed. In P08's case, taking control of technologies by learning technical skills contributed to the fulfilment of other self-growth tasks in his later life and the improvement of individual and social capital within the groups. Here, new technologies were adopted not merely in a sense that they were eventually "domesticated", but in the sense that self-efficacy and the cognition of "what these technologies can do" were effectively grasped and reconfigured.

Exercising control and relational goals. The adoption of new technologies was also perceived as a means of exercising control when realising one's relational goals. Gaining facility with new technologies helped participants fully engage in every bit of community music activity, in terms of having a common language with other group members, as well as feeling control upon maintaining social relationships. For example, the motivation of one participant's adoption of YouTube was influenced by her social network of music:

> "I was forced to learn how to use YouTube. Because the choir people keep saying, "Oh there is a wonderful recording on YouTube, and listen to that", whereas before I had never watched [videos on] YouTube." (P04)

Lack of control or lower self-efficacy may impact the realisation of relational goals. As mentioned in section 3.1, technical skills and musical competence accumulated through

doing; the process of accumulation took time. In many cases, self-efficacy in technology use contributed to a higher level of control; and technical skills and self-efficacy in tandem sustained the enactment of the emergent music practices mediated by technology. In the interview, four participants mentioned that they were keen on seeing photos shared within groups, especially after group trips or performances. These photos were of value for shared reminiscence or self-presentation. For instance, participant 06 sometimes put those shared photos "*on [her] website and [did] tell her friends where it is*". Two participants (P03, P04) became interested in trying out cloud services for similar purposes but became frustrated when they were unable to save photos to their personal computers:

> "Somebody has sent me something, in fact, it was from the choir, with pictures from Dropbox, and I set it up, and then I got it a real mess, and I deleted it [Dropbox]. And I decided that I don't want to be in that [using Dropbox], and then somebody else send[t] some photos from Dropbox, and I thought, I would quite like to see them but [using Dropbox is not easy for me]. And then I am not on Facebook, either, I refused to go on that." (P04)
>
> "The first time I used [cloud storage] was [for] the photographs, shared photographs. There are practically nicer ones from someone else taken… unfortunately, my computer wasn't in manners, so I haven't been accessing [those photos]." (P03)

We are not suggesting that those who failed to use or do not use technologies are unable to exercise control when actualising their self-growth or relational goals. Exercising control was dependent on technological tools only when these technologies had been defined and configured by existing community music practices and an existing network of music possessions. Alternatively, participants sought workarounds that worked best with their existing practices (e.g., P08 preferred buying CDs from ChoraLine to downloading recordings from the website). This finding echoes the notion of "proactive coping", that people are active in seeking alternative means to desired outcomes rather than passively accepting (Ouwehand, de Ridder, & Bensing, 2007; Stenner et al., 2011).

3.2.3.2.2 Supporting role transitions

Supporting role transitions in a time of change. In our data, two participants related their technology use to the experiences of being in transition. Participant 09 lost her husband four years previously. She previously relied on her husband for information and technical help. She "*started using technologies a lot more*" since then, and she felt the need to "*find it out herself*" for almost everything. In this case, technology use in general symbolised a transition to a more independent role. This observation also indicated that the use of technologies mediated daily practices in a time of change.

Music streaming technologies coordinated the ways in which our participants managed and reflected on their new spatial and temporal arrangement after retirement. Participant 05 retired one month previously and was experiencing the challenge of re-negotiating and re-arranging the limited space at home. As we have mentioned in the section *revisiting*, he found a workaround to transfer CDs into minidisks and MP3s, so as to save space at home. He decided to do so right after retirement. However, during the course of our interview, he mentioned that he began questioning the value of doing so:

> "I found it [transferring music] was too time-consuming. I am not a patient person. It is because of patience that I was to sit down, to give out the time and play. I just wanted to work." (P05)

His notion of "time-consuming" implied that the practice of transferring music with technologies might not configure itself into his existing, valued life routines. He further justified this with his perception of the affordance of streaming technologies:

> "Why should I, where I can do stream music. So why spending hours, creating CDs or computer files when I could have what I want, I mean, the wonderful thing about Spotify is that we all know every recording is there and there are a lot." (P05)

A few retired participants (e.g., P10, P08) retrospectively mentioned their worries of being isolated and being incompetent following retirement. In such cases, retirement was a catalyst

for future self-development, and motivated participants to seek opportunities for social participation. Technology, although not mentioned explicitly, manifested itself in different ways: it coordinated active participation, and supported improved self-efficacy as the skills of using technology accumulated. In other words, technology use supported role transition in a time of change by assisting participants to actualise their desired identities, which were always connected to notions, such as "stay busy", "being active", "not old". Literature shows that such identities have implications for active ageing by enabling self-actualisation and empowering people with resilience in a time of change (e.g., Ekerdt, 1986; Rozanova, 2010; Lazar & Nguyen, 2017).

Supporting socio-spatial role transitions on a daily basis. Here we extend the scope of *technology* to information and communication technologies in general, to discuss a bit about role transitions across multiple social circles in old age. We asked participants to reflect on their technology use in general during the course of interviews. Results showed that our participants strategically connected their technology use with roles in different social circles. Three main social circles were mentioned by our participants: (i) the family circle, (ii) the friendship circle, and (iii) the circle of community group members. The family circle had the highest level of intimacy, while the group member circle was considered the most lightweight and "contextualised" ones:

> "That's [making friends while singing] gonna be incidental. But when you retired, you are no longer in that central position, nor do I necessarily want to be, but you do make friends. But things are getting slightly contextual …" (P08)
> "I suddenly realised this the other day when I … you have people for lunch, things, but they are totally different individuals. And every route seems to be isolated, dancing, choir, I see them on the street… but no other contacts." (P07)

This finding resonates what Christena Nippert-Eng (1996) termed as "boundary work", that the selves and identities are negotiated to maintain and refashion segmented cultural categories of people's lives. It also embodies the social identity theory in terms of the existence of multiple self and variable self (Hopkins & Reicher, 2016). In other words, different social circles among our participants provided relational and cognitive contexts to

shape their many facets of identity. Although differing in the level of closeness, different social circles intersected with each other (Wang, Knearem, Gui, Gupta, Zhu, Williams, & Carroll, 2018).

Through the use of technology more generally, our participants reflected on their perceived closeness with others and the contextual information that might affect the ways in which they communicated and shared information and media files across different social circles. ICTs enabled both the "intimate channel" and the "lightweight channel" of communication (Kelly, Gooch, Patil, & Watts, 2017) that co-existed among the three common social circles mentioned above. In our data, the most prevalent communication tool among the music group member circles was e-mail; occasionally, text messages and telephone calls were used for meet-ups. The prevalence of e-mail usage further extends Farnham and Churchill's (2011) findings, in which a slightly younger sample prefer using e-mail for personal, private sharing across different facets of social life. In terms of the other two types of social circles, our participants reported the greatest variety of communication tools when they got in touch with family members and close friends. For example, they used the mobile phone and text messages for day-to-day communication, Skype for the communication with cared others over long distances, e-mails for sharing files and documents, and Facebook for updates of children and their extended family members. Most of them reported that their family members introduced new technologies to them (e.g., Twitter, Spotify, Dropbox, and sending voice messages). This observation resonates with what Wang et al. (2018) have found that technology use among older people in two medium-sized cities in the United States frequently occurs within the family circle. Our participants negotiated different roles through different communication channels (Vitak & Kim, 2014) with the consideration of normative and contextual factors (e.g., the closeness of the relationship, whether the person could be disturbed by phone calls):

> "I 've got a friend, I said I can send you an email. and she said no no no, you just ring me up. I said alright. but you know, you never know if people are there, or if you are disturbing them." (P06)

> "[To stay in touch with] my children, [I use] e-mails, texts, [and] telephone. [I] only Skype when we are out of the country. So, e-mails are great. [Emails are] better then [the] telephone because you can send it, and they'll pick it up when they are ready to pick up. You know, it doesn't interfere with anyone. [The telephone] really intrudes sometimes on what you are doing. But it is lovely with the family phone, when you get cold calls, it's really unexpected…" (P07)

In line with Farnham and Churchill's findings (2011), participants attempted to and were comfortable with using the appropriate tool for the appropriate communication contexts. During this role-negotiation process, our participants reflected on the closeness of relationship, and the context of the person to be contacted. Technology usage and the reflections of social relations and communication contexts were impacted by role-negotiation and "facets" of their lives.

3.2.3.2.3 Community music as a social space

Community music was not just where group music-making was carried out. Instead, it functioned as a "social space". Here we adopt the notion of "social space" from Taylor et al. (2016), which is defined as "hubs of community, where people come together to work together, learn from each other, or simply socialise". All our participants reported that they "incidentally" made friends from music groups. As mentioned in the previous section, unless established strongly and earlier, the friendship built from community music was highly contextual. Likewise, social circles drawn from different activities or hobbyist groups were perceived as "isolated" (see also Nippert-Eng, 1996). All our participants were comfortable with the contextual, hobbyist-based, lightweight camaraderie, and accepted the natural shift in the social network from close working circles to "contextual" relations after retirement:

> "It tended to be friends I see at the choir, and we are friendly. We go to pubs afterwards, that sort of things. But there are very few of them that people I see outside of that context. Some of my old friends joined the choir, [and] we do things in other contexts." (P10)

Also, our participants attempted to manage the boundaries in offline contexts. For example, participant 10 found it strange to share her experience of choral singing with her other friends: "*I seldom try to sell my tickets [to my friends and family not involved in community music] - it's very weird.*" Participant 08 recently bought tickets for his extended family members to attend one of his concerts, but he doubted that they would be willing to "*come again with their own expenses*" and the music he performed was "*not in their normal area of musical experience*".

Re-distribution of competences in social spaces. As we have mentioned in the section on exercising control, requisite competences of meaningful participation were distributed between music group participants and technological tools. Here we extend the observation further and argue that competences can also be re-distributed between different people, resulting in the formulation of different roles and perceived social support. For some, the competence with technologies were allocated to another "technological person" in their social network. This person could be a family member, a friend, or a group member.

> "She [a music group friend] loves anything technological. I just give her an idea [and] she is aware. She is much more confident with her … computer, iPhone, or whatever. And, um, she is not a good teacher because she goes too fast. Then I can't remember what she says. … I have to be the sort of person write things down to … maybe [I feel] yes, that [is] for what to do first, then that, then that… right click, left click, whatever on the computer. Literally, I put everything down [in a notebook]. I've been [interested in] learning something new." (P04)
>
> "I have somebody in my choir. He has a free space – he doesn't pay to come. As an exchange of that he is the Sibelius[27]man. So, if I've got something, I send it to him. He can get it mixed, he could get it not for money, but as a skill. And he likes to do that." (P11)

[27] Sibelius is a commercial scorewriter software developed by Sibelius Software. It is used by music practitioners. The main functions of Sibelius include editing/printing scores, playing music back, and producing legible scores for editing, printing and publishing.

In the case of P04, competences were distributed between herself, her "technological" friends, and her written notes as supplementary memory aids. For P11, she was happy to offer free entry for the group member who was a great help to her in editing music files with a professional music editing tool. The roles within her choir were re-distributed. The reciprocal relationship among group members and friends contributed to perceived social support among individuals. As such, participants formed a sense of others through receiving and giving help within their groups. The sense of others further contributed to an increased level of mutual intimacy and reinforced the perception of group norms. Existing research shows that perceived social support is an important source of positive emotion in one's later life, as social cohesion formed through groups provides "buffer zones" between psychological stressors and well-being (Cramm, van Dijck, & Nieboer, 2013). Also, the active ageing literature suggests that the reciprocal relationship in "social spaces" impacts participants' health and well-being via the psychological pathway of self-efficacy. In the case of our data, technology-mediated practices in the "social spaces" of community music have implications for active ageing.

3.2.3.2.4 Tensions in identity management online

The interview data revealed tensions in relation to identity work when participants failed to manage their multiple self-presentations online. In particular, the emergent practice of sharing music with streaming technologies (i.e., YouTube) brought the challenge of "*context collapse*" (Marwick & Boyd, 2011). Participant 06 mentioned the tension she experienced when having discovered a video of her being posted on YouTube by one of her choir friends. Her first reaction was surprise: "*I was not told that I was to be put up on YouTube, so it was a bit naughty.*" Later, she found the humour in it and told a few friends to look it up. However, she had concerns over the accessibility of YouTube among friends of her age: "*I don't have people who had ever looked at it, and [my friends] used [YouTube] rarely.*" Later, this situation triggered new concerns about her self-presentation online and her desire to control her own privacy:

> "I don't know if YouTube takes things down after a certain time or something. I would not have chosen […] if I was going to pick a video or even audio of mine, singing to a public domain, this is not the situation I would have chosen. I've got much better recordings of that" (P06)

This participant explained that her concern came from the blurring boundaries between her music circles and work-colleague circles: "*if you Googled me, maybe [you] wanted to know about my professional activity or something, but what you've got was me in evening dress singing a lovely but old-fashioned pop song.*"

In the case of P06, tension arose when participants intended to share their experiences and feelings of community music participation but had little knowledge of boundary management with social media and music streaming services. As mentioned in the previous section on the situated use of technology (see section 3.2.3.1), browsing music recordings of rehearsals/performances and sharing photographs of performances and group trips face-to-face were prevalent and enjoyable activities. Here YouTube had proved to be a double-edged sword: it saved the effort for sharing to some extent, but it also brought new problems and concerns among people, especially the cohort in this study, with little knowledge of the tactics of social network sites (e.g., using nicknames, obscuring real identities online, controlling privacy settings). This also resonates with similar online actions such as "un-tagging" on social network sites among young people (e.g., Besmer & Richter Lipford, 2010; Lang & Barton, 2015). This may result in anxieties in relation to self-presentation – a phenomenon that is common offline (Baumeister, Tice, & Hutton, 1989) and has become apparent in online communication research with younger generations (Thomas, Briggs, Hart, & Kerrigan, 2017). To this end, we provide a concrete case of the experiences of "contextual collapse" of community music in old age.

To summarise, technological tools played a coordinating role in sustaining community music practices, and there were three pathways that technology-mediated practices contributed to active ageing. First, the situated use of technology helped people to exercise control in pursuing self-growth and relational goals of meaningful participation. Accumulated technical skills and confidence contributed to senses of accomplishment and control. Second,

technological tools supported role switching across different social circles by functioning as communication tools. Technological tools also supported role transitions in a time of change (i.e., transition to retirement, loss of partner) by helping participants complete their desired identities and adapting to the temporal and spatial arrangement of new situations. Third, technology use involved in coordinating a variety of co-dependent community music practices in support of the construction of collective identity. The use of technology also reconfigured the distribution of roles and competence within the "social space".

3.2.4 Discussion

With the findings so far, we answered the two research questions on the situated use of technology for community music participation, and its association with psychological well-being and identity development. Here we draw from the social practice theory to discuss how new practices develop and are dependent upon new technologies. Finally, we write about how age is associated with the situated use of technology in the context of community music.

3.2.4.1 The development of emergent technology-mediated practices

The participants' accounts with respect to technology-mediated practices (e.g., sharing, revisiting) illustrate an unsurprising fact that participating in community music digitally means carrying out practices like sharing, revisiting, recording, managing, and transferring music with the help of digital music devices, streaming music services, and cloud-based technologies. Social practice theory proposes that "*new practices involve novel combinations of new or existing elements*" (Shove et al., 2012, p. 32). In light of this, technological devices function as a new, constitutive element of community music practices. Then we ask, how do such technology-mediated practices emerge and develop? How are these practices dependent upon technologies with respect to *having* and *doing* (Shove, 2007)?

One observation drawn from our data is that the *doing* of community music practices (i.e., sharing and revisiting, see section 3.2.3.1) was sometimes contingent on *having* and *learning* to use digital technologies. Our participants' use of earlier technologies (e.g., MIDI files, computer, MP3, CD players) and their music possessions had already reached a "provisional

equilibrium" (Shove, 2007) between *having* and *doing*. They chose to stay with technologies that they were familiar with and kept them congruent with their routine practices of community music. However, on some occasions, life changes and events may challenge the established balance and lead to uneasiness, such as P05's downsizing case (see section 3.2.3.2). The intention of managing home spaces might motivate participants to upgrade music storage format and revisit their old collections (e.g., P05). In another case, P04 with relational goals through participation felt "social pressure" from the group, that might push her to learn to use new technologies such as YouTube. As such, the "provisional equilibrium" between music practices and technological tools is beyond merely acquiring new things and getting rid of old things. Here the reconfiguration of *having* also entails *learning* to use new technologies and *having* new technologies as possessions. *Having* is contingent on *doing* (i.e., music sharing and revisiting practices), such that the *technology-competence linkage* and *technology-meaning linkage* are reproduced and transformed potentially and might shape the future development of practices (Shove et al., 2012). To illustrate how technology-mediated practices emerge and develop, we then discuss the development of the *technology-competence* and *technology-meaning linkage* in more detail.

First, digital music technologies are adopted by our participants when these technologies were incorporated into an existing framework of expectations and competences established by certain practices[28]. However different the individual trajectories are, sharing and revisiting music digitally become increasingly regular as more community music participants do it. In other words, technology legitimates itself as an updated element of community music practice when the *technology-competence linkage* is "reproduced and enacted" (Shove, 2007, p. 88). Driving forces of the development of the linkage may come from practices or technologies, such as the availability of technological innovations, the accumulated technical and musical competences (see section 3.1.3.3), and new motivations that emerge through participation (i.e., participants' self-growth goals and relational goals through community music participation, see section 3.2.3.2). The ready availability of streaming technologies is a necessary but not sufficient condition for technology adoption. According to the interview

[28]Of course, practices such as music sharing and revisiting themselves change as well.

data, most of our participants were aware of streaming and cloud technologies, but they often regarded themselves as "observers" of technological changes. For those who eventually took up these new technologies, they were aware of the prospective benefits of these technologies and had mastered the necessary forms of competences or were willing to spend time learning such skills and grasping the requisite competences (e.g., P08's master's-level degree in his 50's). Individuals' prior experiences and different levels of technical skills unsurprisingly result in different individual trajectories of technology uptake. For example, for some participants, the URL of a piece of music on YouTube was seen as analogous to digital music files that they had long been using as email attachments. For some, music resources on YouTube and Spotify were a substitution of their music collections. A lack of competence or interest in developing these competences may leave people with an "observer" attitude or the tendency of avoiding the feeling of incompetence (e.g., P03 and P04 gave up using Dropbox due to the lack of competence, see section 3.2.3.2).

Second, the *technology-meaning linkage* has been successfully "reproduced and enacted" (Shove, 2007, p. 88) through sharing and revisiting practices alongside the adoption of digital music technologies. Digital technologies play a role in coordinating practices (see section 3.2.3.1), through which *self-growth goals* (e.g., to learn new knowledge in later life) were achieved and *social connections* were established and maintained. Mastering technology was meaningful for some participants, as it aligned with their self-growth goals and *forward-facing identities* (e.g., P04's use of Kindle and P08's accumulated technical skills through the Master's course at the age of 50 were meaningful for becoming a quick learner or a better musician). The use of technological tools reflects future-oriented self-images in response to life changes or the foreseeable future. Also, meaningfulness can be constructed from a sense of belonging to groups, which is an important element of active ageing. In section 3.1 we have noted that one of the characteristics of meaningful participation is collective identities. For all participants, the use of technologies supported communication and collaboration for meaningful participation, which enhanced the collective identity of the group. For some, this means that they were "forced" to use YouTube to stay tuned with conversations or to revisit the downloaded recordings together, such that they felt like part of the community. The social psychology literature (e.g., Hopkins et al., 2016) elaborates that the collective identity of a

group impacts the "psychological field" of oneself and shapes future practices that are perceived as meaningful. Following this strand of thought, Creech, Hallam, Varvarigou, Gaunt, et al. (2014) suggest that such future-oriented and collective identities are vital for active ageing. Collectively with our data, the situated use of digital music technologies is meaningful because these technologies are implicated in existing and future practices of community music.

Taken together, the emergence and development of music sharing and revisiting practices with the help of technologies are dependent on the effective, continuous configuration of "complex assemblies" (Shove, 2007) of technological devices and music possessions. Late middle-aged and older people adopt digital technologies, and thereby, the *linkages of technology-competence* and *technology-meaning* have been successfully reproduced and enacted. This extends the adoption path to new technologies, taking notions of competences, social connectedness, self-development, future-facing identities, and collective identity as core principles and elements. This enables us to contribute to implications for technology adoption, which will be described in section 3.3.1.3.

3.2.4.2 Is age significant in the situated use of technology

Although age comparison between the young and the old is beyond the scope of this research (nor is it the focus of this dissertation), ageing and the consequences of it are relevant in thinking about how technology sustains community music practices and why certain technological tools might be needed (Light, Howland, Hamilton, & Harley, 2017). What emerged from our data is that consequences of ageing, as well as the consequences of retirement, are associated with the way in which *meanings* and *competences* of practices are enacted and configured. The findings with regard to the impact of health-related physical conditions (especially voice conditions) on one's level of commitment to community music are ageing-specific. Though technological *competences* and prior experiences in some cases are inevitably different between those who are still in employment and those who retired 10 years previously, age itself does not emerge as an obstacle to technology use here (see also Molapo et al., 2017). The two most prominent reasons for non-use (i.e., lack of control, not

worth the time) in our data may apply to other age groups as well (e.g., Coyle, Moore, Kristensson, Fletcher, & Blackwell, 2012; Kelly et al., 2017). This implies that ageing is more like a circumstantial factor in contextualising changes in one's 50's and 60's (Light et al., 2017), and the changes may result in different levels of skills, confidence, motivation and identities. It is plausible that future older cohorts (e.g., the "younger old") have different landscapes of technology use, because they may be more familiar with (e.g., Friemel, 2016) or still be challenged by the ever-changing technological innovation.

3.2.5 Summary

We investigated the situated use of technology in relation to meaningful participation in community music, and in particular looked at the coordinating role of technology in sustaining music sharing and revisiting practices. Moreover, by looking at how and why people use and adopt new technological tools in the context of community music, community music practices contribute to active ageing from three aspects: exercising control, supporting role transitions, and creating a social space in which collective identities are enacted. This study provides a nuanced picture of how community music practices are dependent on technology and the role technology might play in sustaining the development of these practices through the enactment of the *technology-meaning* and *technology-competence linkages*. In the following section, we draw on the findings from section 3.1 and 3.2 to reflect on how meaningful participation and active ageing might be accomplished and how technology might be used to support them, followed by a comparison between our case and non-musical social participation in the HCI literature.

3.3 General Discussion

3.3.1 Support for meaningful participation and active ageing

Our findings so far show how our participants experience meaningful participation and active ageing and how new technologies play a role in coordinating music sharing and revisiting practices. In this section, we discuss two aspects of implications for community music

practitioners. Rather than providing direct implications for technological design, however, we seek to illuminate aspects of meaningful participation and active ageing that could be supported more generally. After that, we describe implications for technology adoption in section 3.3.1.3.

3.3.1.1 Leveraging social participation across different social circles

In examining how community music functions as a "social space", we found that contextual, interests-based social relationships were established and maintained among music group members. The community music group circle intersected with family and friend circles. These different circles altogether provided relational and cognitive contexts, which shaped the multiple facets of individual and collective identities. It is not surprising that the "social space" of community music enables the building and maintaining of social relationships, which contributes to active ageing. However, how social relationships are maintained and could be sustained has received little attention in the active ageing literature and calls for a different focus: rather than building relationships, how might social relationships be linked to community music practice and its constituent elements?

First, we propose reframing community music participation in a way that highlights the *meanings* for participation in each social circle involved. For example, an opportunity for community music practitioners might be to design activities for the "audience-choir reciprocity", that through singing some choir members construct an emotional connection with their audience and establish a sense of validation (Bailey & Davidson, 2002). Participant 04, when talking about her own experience of organising a choir workshop with 50 people who had never tried choir singing before, pointed out that the presence of family and friends was vital to encourage new members (especially those with little musical knowledge and choir experiences) to overcome their fear and become confident. By framing community music participation with the consideration of the "audience-choir reciprocity", we may attract newcomers who are not intrinsically interested in community music or have little prior knowledge but enjoy the presence of audiences and could be motivated to undertake further activities. As such, the incorporation of the community music circle and the family/friendship

circle enhances a sense of safety and empowerment. As we saw in the cases of P10 and P08, some existing ways of incorporating family and friends in community music practices (e.g., inviting family/friends to concerts, buying them tickets) did not support more extensive engagement. To this end, it might be possible for community music practitioners to reframe community music activities as informal, open, and flexible opportunities (see Hillman, 2002) to spend time with family and friends. Taylor et al. (2017) have also noted the value of multiple short making events in encouraging participation and improving awareness among maker community participants. Drawing on the incorporation of multiple social circles could support engagement and awareness of community music participation.

Second, our findings point to the value of activities that demonstrate the skills and progress that participants have made through participation. Given that meaningful participation is cumulative, our results imply that technology preferences are associated with participants' prior technological experiences, the openness towards taking up new technologies through *doing* (i.e., the accomplishment of music sharing and revisiting practices), as well as their level of commitment to the community. As competences accumulate and develop, updated forms of practices may emerge, such as using streaming music services to learn music and replace one's existing music collections (see section 3.2.3.1). Being aware of the accumulated competences may have positive consequences for participants' self-efficacy and confidence in realising their relational or self-growth goals (see section 3.2.3.2). Therefore, we recommend that practitioners should look into supporting the visibility of progress and skills in community music (perhaps with technology as well). This implication resonates with some studies in HCI (e.g., Lindley & Wallace, 2015; Massimi, Bender, Witteman, & Ahmed, 2014; Taylor et al., 2017), which argue that demonstrating one's expertise and supporting knowledge sharing in social participation are especially important for healthy and active ageing.

There are a variety of ways of demonstrating skills and progress in community music practices. Practitioners should first identify activities or moments that concern skills and progress, such as the completion of a concert, learning a song, downloading a piece of music shared by others to one's laptop or MP3, or confidently getting sufficient information for

one's future learning aspirations. As for informal groups that value socialisation more than learning, highlighting milestones such as the number of concerts that one has completed, the number of audiences that they have reached, and how many cities or venues that they have been to may help to build the confidence among participants. Alternatively, music practitioners might highlight one's unique skills to establish a sense of reciprocity. Recognising roles (informal or formal) in groups, such as a technical person, a CD producer, a social media person, or even a painter for music[29], could be beneficial in maintaining social relationships and sustaining community music practices. Of course, the task of identifying and making such roles visible is challenging and burdensome for practitioners, and it is likely that these roles may not align with the existing formality of some music groups. Yet our findings point to the value of demonstrating such skills, progresses, and roles for facilitating participation. How to effectively establish such roles warrants situated investigation and further research.

A third way of leveraging social participation is by enabling *competence* sharing and technical support from different social circles. We noted that technical support from family members, although often occurring (see Farnham & Churchill, 2011; Wang et al., 2018), may not be available nor always be effective. Our findings confirm Wang et al.'s (2018) that technology is often introduced by the elders' family members (e.g., partners, adult children, grandchildren). However, for some, they were reluctant to ask for help from their family because they did not think their family had sufficient time or patience. Gutierrez and Ochoa (2016) even note that the approach used by adult children to take care of their parents with respect to technology use may result in a "vicious circle": with tensions and stress engendered on both sides. As such, our participants tended to seek help from peers in their community groups.

In light of this, our findings suggest that developing new technical roles in groups (e.g., specialists with technological skills in Carroll & Rosson, 2013) and enabling the reciprocal, informal technical help from peers (e.g., Müller et al., 2015) may ameliorate the tensions of

[29] See an example here: http://www.lucycavendishsingers.org.uk/gallery/paintings-lesley-fotherby

elders' learning to use technologies from their family. For example, community music practitioners might consider setting up inter-generational networks for sharing digital skills in their groups (if there are younger participants who are relatively more technology-savvy). Also, practitioners at U3A might reframe existing technology learning classes and other interests-based programmes (e.g., making the computer learning classes at U3As playful and situating some of the technical courses in local events and activities), so as to provide a productive and meaningful technology learning experience and support "skill-swapping" (Lindley & Wallace, 2015). However, the informal technical help within the community groups might not always be available, in which case practitioners might consider projects that pairing the elders and the younger volunteers (e.g., Carroll et al., 2012) or popup sessions[30] in public places "hooking" people up and showing them the value and meaningfulness of technologies in solving their real-life problems.

3.3.1.2 Incorporating technological competence as part of the community music practice

The second aspect of implications that we wish to highlight is concerned with the non-adoption or limited use of technology from the perspective of practice. Comparing cases of adopting and not adopting technologies in our data, we identified two reasons for non-adoption: perceptions of technologies as not being worthy of time investment, and the lack of control over technologies. The lack of control over technologies, in particular, speaks to our findings concerning the development of the *technology-competence linkage*. In our data, the lack of control over digital music technologies limited the perceived value and motivation of adopting these technologies. For P10, all of her files "*automatically go to [the] cloud*" and "*everything is saved*". However, she had never "*actually chose something to put it in, … and had never tried to retrieve anything [from the cloud]*", as she "*was afraid it's gone*". Likewise, P07 underwent an almost unconscious process that she could not control when downloading music from websites: "*I still don't know what I do...I just click, click, and*

[30] The Down Memory Lane project by Age UK (2014) provides nice examples for such popup and taster sessions.

click…and sometimes nothing happens, and I don't know anything, so I plug it [the MP3 player] again… It's like magic there". Unsurprisingly, the lack of competence in technology use may hinder the adoption of digital music technologies and might further impact the way in which these technologies coordinate community music practices (e.g., the difficulties of downloading shared photos from Dropbox affected P03's experiences of participation).

Here we adopt Kirk and Sellen's (2010) findings on the types of family archiving to further elaborate the tension between the lack of control over technology use and community music practices. Photos shared by other group members on the cloud are termed and expected as artefacts on "display", according to Kirk and Sellen's categorisation. In our data, these shared photos often entailed reminiscence and storytelling functions (e.g., P07's revisiting of choir recordings with her daughter). In contrast, in the case of P10, cloud-based systems are actually "used" as tools for "deep storage" – a concept or a physical method of storing artefacts out of mind and out of sight. In other words, there is a gap between the perceived use of technologies and the actual usage enabled by existing technological competences. This tension implies that in order to support meaningful participation, a digital system being introduced to older adults might need to explicitly demonstrate its potential exploitation (i.e., in support of reminiscence and storytelling function via ways such as capturing information in relation to events, people, time, and place) and sustain people's existing routine practices (in this case of sharing and revisiting music in face-to-face occasions). This argument is backed by existing HCI research. For example, Gutierrez and Ochoa (2016) suggest highlighting the benefits of technology in family meetings, so as to satisfy the elders' communication needs and enhance their willingness to adopt technology. In sum, we evidence how the absence of knowledge regarding the meaningfulness and competence of using technologies in people's existing practices might challenge their technology adoption and will likely influence their experiences of social participation.

3.3.1.3 Considerations for adoption

In the above two sections, we wrote about two aspects of supporting meaningful participation and active ageing. In this section, we look at the role that technology might play in

community music practices and *speculate* about how these practices could be utilised to enhance technology adoption to support community music and active ageing. These speculative considerations are not requirements generated for the development of systems, nor the so-called "implications for design" that Dourish referred to as "genre conventions" (Dourish, 2006; as cited in Lindley, Coulton, & Sturdee, 2017). In particular, we consider ways of incorporating technologies to leverage social participation (see section 3.3.1.1) and, in the meantime, how competences and meanings could be incorporated into existing community music practices (see section 3.3.1.2) to support the adoption of technologies and to integrate the elderly and others together in social participation.

Supporting new participants' experiences. Our recommendations of leveraging social participation are concerned with linking the family and friend circles with community music practices (see section 3.3.1.1), so as to make those who are new to community music feel safe and confident, and to motivate them to go on with participation. Paper-based flyers on physical poster boards, digital flyers distributed via e-mails and websites are unlikely to reach the diverse audiences from family and friend circles (e.g., those who are not primarily interested in community music, those who have few chances to stop by the physical poster boards or information desks of community centres). Digital technologies might be used to record, curate, and share such information, experiences, and memories of community music participation and spread the enthusiasm of community music. For example, our observation shows that the older people do not rely on social media (e.g., Facebook, YouTube, SoundCloud) for discovering information and events. However, social media could be a supplement to existing activity promotion channels (e.g., websites, email lists, and flyers) in terms of the groups' collective identities and might be utilised to attract the elders' younger family and people who have little access to the existing information distribution channels of community music. Moreover, photos, streamed video clips of performances and rehearsals (some websites already have such information), and even rich media contents from a first-person point-of-view recorded by a head-mounted webcam (Light et al., 2017) might give a sense of participation and a vivid knowledge of the routine practices. This could be particularly helpful for those actively seeking engagement and new to such activities.

Support the sharing of experiences and memories. In addition to attracting the younger family/friend circles to participation, the recorded and shared digital content, coupled with the shared music repertoire, could provide a community repository (e.g., performance playlists, a memory of programmes and flyers). Such a repository can be curated by the elders' family or community practitioners to represent the memories and experiences of one's social participation in later life. Following Churchill, Nelson, Denoue, Huysman, Wenger, & Wulf (2003), technological tools in support of the collection, curation, and storage of such contents might provide valuable memories after the shared contents expire. The rich and vivid digital content could be used as "tickets to talk" (Sacks, 1992) or anchor points when the elders spend time together with others. The digital character of such contents makes it more likely for the "young-old" who have been familiar with technologies and have had some digital traces with regard to their past experiences (e.g., participation in community music). On the other hand, with such a community repository, music group members (e.g., those who are keen on collecting paper programmes of concerts, mentioned by P10; those who are keen on initiating informal musical and social activities, such as P05) could contribute content, revisit these playlists, sing along to the songs, and reflect on the progress that they have made.

3.3.2 What is special about community music

At this point, readers may wonder whether there is anything special about community music, or whether any activity carried out in group settings might lead to similar effects through active participation. Based on our review of HCI research into non-music participation in old age (i.e., making communities, leisure activities, blogging, and crowdsourcing, as discussed in the related work section), we will now discuss our findings and elaborate how they relate to existing HCI literature. It should be noted that this comparison is quite difficult because (i) the reviewed empirical studies only engender a broad picture of the lived experiences of active participation; (ii) the reviewed works are based on different theoretical assumptions and different types of activities. Considering the complexity of the classification of social participation (see section 2.2.2) and different theoretical basis, we would encourage readers to bear this in mind when interpreting and generalising our results. Although our study is on a

relatively small scale, the findings have implications for how this might apply to different scenarios and thus be further generalised.

At a general level, more similarities than differences have been found in terms of constituent elements[31] of participation. Shared meanings for community music and other types of active participation encompass the presentation and development of self, the construction of collective identities, a sense of belonging and engendering emotional attachment with the group. Shared competences entail the actual knowledge of participation (or use of technologies) and efficacy in doing so. Apart from online participation (e.g., blogging, doing crowdsourcing tasks), technologies are also used to support the "enriched experiences" of participation, emotion exchange, and to coordinate the recurring relationship among technologies, music possessions, participants, competence, and meanings. This observation is unsurprising and resonates with Pearce et al.'s (2015) finding with respect to the "ice-breaker" effect of music: music and non-music classes lead to the same bonding outcomes but different temporal patterns of bonding. According to Pearce et al. (2015), music classes facilitate bonding in groups without the prerequisite of knowing each other. Drawing upon Hopkins et al.'s (2016) notion of collective self-realisation (CSR, the cognitive route of identity development, see section 2.3.1) and the relational route of identity development, group singing facilitates the development of collective identity via the "cognitive" route by conveying a shared goal, shared group norms and cultures. In contrast, non-music activities (i.e., creative writing in Pearce et al. 2015) follow the "relational" path, through which mutual intimacy is enhanced by being together and getting to know each other. Pearce and colleagues' more recent studies (Pearce, Launay, MacCarron, & Dunbar, 2017; Pearce, Launay, Machin, & Dunbar, 2016) confirm this finding. As mentioned in section 3.1, we acknowledged the co-existence of both the cognitive and relational route of identity development in community music participation, and implicitly suggested that the two routes weighted slightly differently in different types of community music groups (see section 3.1 for the conceptualisation of formal and informal groups and the accumulative nature of

[31] Here we mean elements in the context of social practice: meanings, competences, and technologies (things) and the roles of technologies.

participation). Taking it one step further, we suggest that a more appropriate hypothesis with regard to how collective identity develops (or how "bonding" is formed in Pearce et al., 2017, 2016) goes beyond the comparison of music and non-music activity (or content of activity), not to mention recent findings claiming that it may not be music *per se* but the feeling of being part of a group that enhances well-being (Pearce et al., 2016). Instead, we suggest future research to elaborate at finer-grained level with respect to the characteristics of participation (e.g., how competence is accumulated and distributed among people, music, music possessions, and technologies, how *technology (things)-meaning* and *technology (things)-competence linkages* are reproduced).

3.3.3 Limitations

As with any social science study, limitations in generalisability result from our qualitative approach to the research questions. The data was collected from a specific population in Cambridge, and the conclusions drawn from this sample cannot be generalised to the late middle-aged and older population as a whole (though a series of studies on active ageing and community music in different locations in the UK pointed to similar patterns, e.g., Hallam et al., 2012b). Nevertheless, our approach and analysis illuminate the subtleties of active music participation and the relationship between technology and community music practices (Dourish, 2006). The two research questions are not only concerned with the evidence of "what people really do for community music participation and technology use", but also with the analytical aspect of "why technology is used or might be needed in this particular way". Our findings concerning the role that technology plays in sustaining and coordinating sharing and revisiting practices, and how these practices are connected to exercising control, role transition and being in a social space address the analytical aspects of this phenomenon, rather than merely seeking for consistency across locations. As mentioned before, Dourish (2006) highlights that ethnography (and other open-ended, qualitative methods as well) in HCI and design is valuable in making empirical and analytical contributions. It may be helpful in future studies of active participation (not necessarily being isolated within group singing) to apply similar analytical models of thinking.

Second, our research has been exploratory with respect to how and why late middle-aged and older participants of community music experience their participation and technology use. We have not implemented technology in the setting of community music, nor have we conducted direct observation on their use of information technologies. However, following Suchman's situated action approach, it is essential to explore how technology use is situated and grounded in people's everyday life and practices, before actually introducing new technologies or changing existing technologies. Instead of merely discussing ICTs in general, our findings relate to a specific type of application – digital music technologies, which provides initial observations of this particular type of technologies/services/applications. Prior research with the ageing population also highlights the importance of investigating the experiences and actual use of particular applications/technologies (e.g., Friemel, 2016; Yuan, Hanrahan, Rosson, & Carroll, 2018). Future research should put more emphasis on technological design and intervention in support of active, social participation with a consideration of the elders' life-course experiences (Vines et al., 2015) and the specific settings of social participation.

Third, the interview data was retrospective and was drawn from past experiences of participants. As such, the participants' accounts of their experiences of retirement are not able to support strong claims about the causality of retirement (or ageing) and actions (nor was this the objective of our research). In this respect, the data provided here was a snapshot of the participants' experiences in this particular period of their lives. We acknowledge that lifestyle changes take longer (Batt-Rawden & Tellnes, 2011). We write in section 3.2 about how the linkages between technology, competence, and meanings legitimate elements of active ageing among our participants. Again, we are not suggesting a music-health causal relationship based on our data. Instead, what is interesting with the findings is that it depicts how later life self-identity and social identities are enacted from continuous, successive performances of active music-making and technology uptake, how aspirations about health, self-development, and social relations are engendered from this, and how practices emerge, persist and develop. Therefore, we would encourage readers to bear this limitation in mind when reading this dissertation and synthesising the results.

The fourth limitation is more like a dilemma particularly for myself – the role of the investigator in qualitative studies. It is inevitable that the investigator's age, gender, identity, and personal characteristics will have some influence on the process of data collection and data collected (Hammersley & Atkinson, 2007). On some occasions, out of curiosity, participants asked me non-research related questions. I decided to answer their questions briefly and tried to redirect them to the research realm as soon and as smoothly as possible. It is necessary to note that building rapport and demonstrating my connections with participants as a "participant observer" at the very beginning of the study was essential in ameliorating this effect. For participants who had seen me or talked with me during my visits to their rehearsals, they were very cooperative and enthusiastic during the study. However, a few participants were not around when I paid my visit to their music groups or did not have a chance to talk to me in person before the study, and these participants tended to ask more irrelevant questions. Moreover, it is also relevant to briefly mention the view of ethnography (and other qualitative methods) in literature. If we see ethnography as a "*model for understanding social settings*", it should be noted that the investigator is not "*a recorder of events as they unfold*", but a person that synthesises empirical evidence and theoretical analysis and who informs the complexity and subtleties of social settings (see Dourish, 2006). To this end, I sought to ameliorate this effect by building rapport with participants and keeping the analysis process rigorous.

3.4 Chapter Summary

Findings in this chapter set the scene for what it means to late middle-aged and older people to meaningfully participate in community music. Music and technology use surrounding it was the starting point of this dissertation. Taking an open-ended approach, the effect of community music practices and the dynamic relationship between practices and technology emerged and became prominent. As such, we started this chapter with an investigation of meaningful participation in terms of time and space, followed by the development of new practices and their constituent elements, and how the development of new practices is dependent on technological tools. The findings suggest that the use of digital music

technologies involves identity development, role transition, and the formation of a sense of control. Influenced by forward-facing identities, repeated meaningful participation prompts further motivations of technology uptake. In accord with Shove (2007), we confirmed that technologies that sustain revisiting, learning, and sharing music are not merely "domesticated", but are incorporated into an existing framework of meanings and competences. What is more, our discussion around the *technology-competence* and *technology-meaning linkages* point to the psychological significance of competence (i.e., self-efficacy) and meanings (i.e., social identity, motivation) to our participants.

In the next stage of this dissertation, we take this discussion on psychological significance forward, but from a confirmatory perspective. As noted in the literature review in this dissertation, it is well documented in the ageing literature that active music participation is associated with psychological constructs, individual differences and in-group coactions (i.e., technology uptake). However, it is not yet clear how the connection between these psychologically-significant constructs and technology use are grounded in meaningful participation (in particular, community music). These are themes to be explored in Chapter 4.

Chapter 4 Use, Self-efficacy and Motivation of Digital Music Technologies among Middle-aged and Older Adults

The previous chapter took an open-ended, qualitative approach to understand the role that technology played in sustaining community music practices. Research question 1 investigated what meaningful participation was and what it meant to an individual community music participant and identified three key characteristics: the accumulation of competences, collective identity and identification, and the distribution of possessions and technological tools. These findings set the scene for further enquiries with regard to the situated use of technology. To answer research question 2, we identified music sharing and revisiting as two prevalent community music practices and highlighted the coordinating role that technology played in these practices, through which participants could exercise control, experience role transitions, and construct and maintain their social relationships in the "social spaces" of community music. These findings allow a situated understanding of how people experience social participation and active ageing.

Chapter 3 mainly focused on the way in which community music practices (i.e., sharing, revisiting) developed and how practices were dependent upon technology. That is, digital music technologies were reconfigured into a field of expectations and aspirations established by practices, alongside accumulated skills, self-efficacy, future-forward identities and motivations. In Chapter 4, we will draw upon the situated use of digital music technologies (see Chapter 1 for its working definition) – an exemplar of technologies for community music – and narrow the focus on the psychological basis of technology use in terms of self-efficacy (a dimension of *competence*) and motivation (a dimension of *meaning*).

Why did we choose digital music technologies as an exemplar? First, existing research and findings in the previous chapter unsurprisingly suggest that community music, even with the older cohort, is going digital. As indicated in Chapter 3, interacting with music among our participants lied in a spectrum of possibilities that were defined, at one end, by conventional or digital listening devices, and at the other, by a collection of interconnected technologies (e.g., PCs, MP3, cell phones) (Leong & Wright, 2013). Also, technology use among older people is likely to go beyond individual and domestic contexts and may legitimate its meaningfulness by corresponding to people's goals (e.g., self-growth and relational goals, see section 3.2.3.2), future-oriented self-concepts, and the belongingness to groups. As such, it is conceivable to situate the use of technologies to the elders' community music participation. Second, existing commercial applications of music, such as iTunes, YouTube, and Spotify, have been developed to support music engagement and identity management (O'Hara & Brown, 2006). However, it is less known how these applications work with group contexts, not to mention their appropriateness with older people. Third, the constituent elements of community music practices such as competences and meanings imply psychological significance at the individual level (i.e., self-efficacy, motivation). The findings in Chapter 3 with respect to how technology use was experienced and linked to active ageing also support this proposition. Therefore, it is conceivable to investigate the psychological basis of these elements further and to confirm the provisional conclusions in Chapter 3. To this end, we assumed the existence of various levels of group participation and identification (as Chapter 3 suggests), with which we could contextualise technology use and its psychological basis.

4.1 Overview of Studies

The overarching aim of this chapter is to contextualise the use of digital music technologies that is contingent on community music practices, and to further confirm our previous qualitative findings concerning the situated use of technology and the association with self-efficacy and motivations. We adopted a less strict interpretation of social practices in this chapter (see Figure 1-1 in Chapter 1). Using two independent samples and recruitment strategies, we conducted two survey studies to investigate uses, self-efficacy, and motivations

in relation to digital music technologies. In study 2, we tackled RQ3 in this dissertation, examining the factor structure of digital music technology use, and how it was associated with demographics and self-efficacy. In particular, differences in terms of age, employment status, and group memberships across the two samples were highlighted. Factor analysis and correlation analysis were used in this study. Study 3 focused on motivations for using digital music technologies in the UK online sample and investigated how motivations were associated with group memberships and identifications using regression analysis. Study 3 addressed RQ4 in this dissertation.

4.2 Study 2: Interacting, Contributing, and Sharing: The Structure and Correlates of Digital Music Technology Use

Study 2 set out to answer the third research question of this dissertation: **What is the factor structure of digital music technology use and how is it associated with demographic variables and self-efficacy**?

4.2.1 Background

Community music practitioners have been interested in opportunities brought by cloud-based technologies and streaming services (Doebele, 2012). However, these technologies were not designed for the elders' purposes and were adopted by them with some difficulty (Sayago, Forbes, & Blat, 2012). Our findings in Chapter 3 showed that digital music technologies sustained the routine practices of group music making (i.e., music sharing and revisiting). To explore further, we surveyed the use patterns of digital music technologies among community music participants (mainly middle-aged and older) and quantified the association between uses and demographic variables and psychological constructs. We ask:

- **RQ3.1: What is the latent structure of the use of digital music technologies?**
- **RQ3.2: How are demographics and psychological constructs in relation to self-efficacy associated with the use of digital music technologies?**

- **RQ3.3: How is music group membership associated with self-efficacy and technology use?**

4.2.2 Methods

4.2.2.1 Procedure

Cambridge local sample. The survey for the Cambridge local sample was carried out between January 2016 and April 2016 in Cambridge. Participants of this sample were given the opportunity to win one of fifteen Amazon gift vouchers. When conducting the survey, we used a snowball sampling strategy to pass the advertisement of the survey on to Cambridge music groups in person and via local portal websites. Due to time restrictions, participants did not complete Use & Gratifications measures (we will come back to this set of data in study 3).

UK online sample. We distributed an online version of the survey[32] in the UK between December 2016 and January 2017. Participants were recruited through a combination of professional online survey platforms (i.e., Qualtrics and Prolific Academic). Only those with an approval rate[33] of 90% or higher were invited to participate. Each participant was paid £1 for completing the survey. They were told that the study was about how people used music technologies. After accepting the consent informant, participants were directed to a survey on Qualtrics. The survey was completely voluntary and confidential. Participants could opt out at any stage. As a further quality check, responses that failed in more than 3 of the 4 quality checks (10.5%) were excluded from the analysis. The complete data for Use & Gratifications questions were available for 153 participants in the UK online sample (we will come back to this set of data in study 3).

[32] The version of survey with UK online sample is an updated one from that for the Cambridge local sample, meaning that although two questionnaires are not fully identical, questions with respect to key constructs reported in this chapter are the same (see Appendix D for more details).
[33] Approval rate is calculated by the percentage of studies for which the participant has been approved (see http://help.prolific.ac/general/prolifics-codebook).

4.2.2.2 Participants

Cambridge local sample. The total number of original respondents of the Cambridge sample was 127. Seventy-seven participants completed the survey in full. Due to the snowball sampling strategy and survey accessibility, the sample also included students. Twenty-five (38.4%) of them were younger than 35, 8 (12.4%) of them were between 35 and 44, and 32 (49.2%) of them were older than 55. We decided to keep the data of those younger than 35 in this sample because (i) it provided a picture of the heterogeneous nature of community music participants; (ii) data from the younger group were used for comparison in the following analysis to give a more nuanced understanding of technology use. Of those who indicated, 42 (63.6%) were female, and 24 (36.4%) were male. The average age of this sample was 47.0 (median $= 53.0$, SD$= 19.5$, 49.2% aged over 55). Thirty-eight (36.4%) of them had formal music group memberships (i.e., choir, orchestra); 10 (26%) had informal music group memberships (e.g., music workshops, classes at U3As, bands, etc.); 29 (37.7%) had no music group memberships. Twenty-eight (36.4%) were employed and 32 (41.6%) retired, 2 (2.6%) were seeking employment and 15 (19%) were in education. Comparing the demographics of the two cohorts (younger than 55 vs. aged 55 and above), we only found significant differences in employment status ($\chi^2[3] = 44.76, p < .001$). In the younger group, 19 (57.6%) were in employment and no one was retired. In the older group, 25 (78.1%) were retired, and 6 (18.8%) were in employment. The older group was more educated (62.5% had degrees of master's or higher) than the younger group (39.4% had a degree of master's or higher and 24.2% were in education).

UK online sample[34]. A total of 153 individuals completed the online survey in full. The average age of the finalised sample was 55 ($n = 153$, 57.5% female, median $= 54.0$, 47.1% aged over 55). Thirty-four (22.2%) had formal music group memberships (i.e., choir, orchestra), 33 (21.6%) had informal music group participation experience (i.e., music

[34] See Appendix D for the full questionnaire used for this sample. Generally similar survey instruments were used for Cambridge sample and the UK online sample, see the next section "Design of the survey" for further details.

workshops, classes at U3As, bands), and 86 (56.2%) had no prior experience of music group participation. One hundred and nine (71.2%) were in employment and 28 (18.3%) were retired, and 15 (9.8%) were seeking employment. Fifty-five (35.9%) had preliminary-to-intermediate education, 59 (38.5%) were university educated, and 39 (25.5%) had master's or higher degrees. Comparing the demographics of the two cohorts (younger than 55 vs. aged 55 and above), we only found significant difference in employment status ($\chi^2[3] = 18.86, p < 0.01$). In the younger group, 64 (84.0%) were in employment and 5 (6.2%) were retired. In the older group, 41 (56.9%) were in employment and 23 (31.9%) were retired.

Table 4-1 Demographics of participants in the two samples

Demographic characteristics	**Cambridge Local Sample (n = 77)**	**UK Online Sample (n = 153)**
Age		
18-24	13.8%	-
25-34	24.6%	-
35-44	6.2%	.7%
45-54	6.2%	52.3%
55-64	27.7%	38.6%
65+	21.5%	8.5%
Mean age	47.0	55.2
Gender		
Female	54.5%	57.5%
Male	31.2%	42.5%
Not indicated	14.3%	-
Employment Status		
In education	19.5%	.7%
Employed	36.4%	71.2%
Retired	41.6%	18.3%
Seeking employment	2.6%	9.8%
Education		
A level or lower	13.0%	35.9%
Undergraduate	28.6%	38.6%
Master's or higher	44.2%	25.5%
Music group participation		
Formal group membership (singing and instrument groups)	36.4%	21.6%
Informal group membership	26.0%	22.2%
No music group membership	37.7%	56.2%

It should be noted that the UK online sample is not a representative one of the general middle-aged and older population. Rather, it is a more technology-savvy sample because we used the online survey instrument and partially targeted people with any form of music group participation. However, such a relatively homogenous sample is sufficient for our attempt to investigate the use of digital music technologies. Previous studies (e.g., Brewer et al., 2016; Kittur, Chi, & Suh, 2008; Kobayashi et al., 2015) have shown that online survey platforms and crowdsourcing tools (e.g., Amazon's Mechanical Turk) are suitable for user studies (even among the older population) with special care in the design of the measurements.

4.2.2.3 Design of the survey

4.2.2.3.1 Developing a taxonomy of digital music technology use

Use patterns of digital music technologies. As there were no established measures of use of digital music technologies among community music participants, we developed questionnaire items from our findings in Chapter 3 and prior literature on music technology use (e.g., Krause & North, 2014; Krause, North, & Heritage, 2014). Drawing on the situated action approach (Suchman, 2007), one principle guided the decisions about which items to retain: we wanted the list of items to be closely related to community music participants' everyday practices and to be comprehensive and familiar to middle-aged and older people. The survey questions were developed through extensive piloting. The final items were piloted again with English-speaking middle-aged and older people in the local community.

We asked participants to rate their frequency of performing a set of practices in relation to digital music technology use with a 6-point scale rating from "daily", "few times a week", "few times a month", "few times a year" to "never". The items in relation to use of digital music technologies include "search for music online", "bookmark a piece of music online", "rate music online", "recommend music to someone", "post a comment about music", "upload music to SoundCloud", "record music", "buy music-related devices", "learn music online", "email with music groups". Except for "rate music online", all items were mentioned explicitly by our participants in the interview study (see Chapter 3) or in previous literature

on community music participation (e.g., commenting on music on Facebook among choir members in O'Flynn, 2015, while sending comments via e-mails were explicitly mentioned by our participants in Chapter 3). However, we decided to retain the item "rate music online", as it is a typical feature of existing mainstream digital music services and has implications for the customisability of such systems (see Lee & Waterman, 2012).

Music sharing frequencies within and outside music groups. Two questions about music sharing were asked: (i) How often do you share the following… with music group members; and (ii) How often do you share the following outside music group members. Items under each question included "digital music files", "links of music online", "sheet music", "music relevant information". The same 6-point scale ranging from "daily" to "never" as that of the use pattern questions were used. All of the items in relation to sharing have been explicitly mentioned by participants in Chapter 3. We were interested to further confirm these qualitative findings with respect to sharing practices of community music participants.

4.2.2.3.2 Self-efficacy

Drawn upon the findings of Chapter 3 and literature with regard to self-efficacy (e.g., Compeau et al., 1999; Hsu & Chiu, 2004), we asked three aspects of self-efficacy questions in the survey: general computer use self-efficacy (4 items), music-tech-specific self-efficacy (3 items) and communication-specific self-efficacy (3 items) with a series of 11-point scales (the percentage of confidence from 0 to 100%). We adapted the questions and modified the description to evaluate the participants' self-efficacy of technology use. Example questions of general computer use self-efficacy were made up of "deal with email attachments", "enter a URL in a web browser"; example questions of music-technology-specific questions included "find a piece of music on the Internet", "transfer music between two digital devices", and "transfer physical music (e.g., vinyl) to a digital device (e.g., computer)"; example questions

for communication-specific self-efficacy included "post a query in a discussion to forum", "send e-mail messages" (see Appendix D.2 for a full list of questions[35]).

Table 4-2 Means, standard deviations, Cronbach's Alphas and correlations of psychological constructs (Cambridge local sample)

	M (SD)		α	r				
	Age <55	Age≥ 55		2	3	4	5	6
1.General computer self-efficacy	85.67(13.23)	67.22(24.42)	.72	$\mathbf{.65}^{***}$	$\mathbf{.35}^{**}$	$-.04$	.05	$\mathbf{.30}^{**}$
2.Music-tech self-efficacy	89.73(12.44)	76.78(25.21)	.70		.20	.01	$-.02$	$\mathbf{.30}^{**}$
3.Communication self-efficacy	98.69(3.72)	97.50(7.57)	.58			.20	$-.08$	$-.02$
4.Collective identity	3.42(.72)	3.59(.61)	.55				$-.09$	.08
5. Segmented identity	3.28(.86)	2.61(.99)	.64					$\mathbf{.29}^{*}$
6. Individual identity	3.80 (.72)	3.39 (1.04)	.61					

*Note: * $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$. All items in 1,2 and 3 were measured with a 11-point scale from 0% to 100%. Items in 4, 5 and 6 were measured with a 7-point Likert scale. All item scores were standardised before factor analysis. Correlations that are significant at $p < .05$ are in bold typeface. M – mean; SD – standard deviation; r – correlation coefficient.*

4.2.2.3.3 Community orientation

We adapted existing scales to measure three types of community orientation in the Cambridge local sample: collective orientation (4 items), segmented orientation (3 items), and individual orientation (2 items). Collective orientation refers to the collective identity of participants towards their music groups (see Tajfel & Turner, 1979). The items were adapted from Brewer and Chen's scale (2007) on group collectivism. Questions concerning individual orientation were adapted from Brewer and Chen's scale (2007) on individualism, which is referred to the emphasis on individual uniqueness. The conceptualisation of segmented orientation resonates with our findings of role transitions across different social circles in section 3.2 (see also "boundary work" in Nippert-Eng, 1996; the multiple self and variable self in Hopkins & Richer, 2016). Items for segmented orientation was adapted from Farnham

[35] Not all self-efficacy related questions were tied to the objectives of this study, therefore we only used a subset of the listed questions for analysis here.

& Churchill's scale (2011) on faceted identity. In the present study, 7-point Likert scale was used to measure each item.

A factor analysis (principal-component factor analysis with varimax rotation) was conducted to verify the dimensionality of community orientations (see Table 4-2). The three factors accounted for 68% of the total variance. We dropped the 4th item of the segmented-self per the results of factor analysis, and the alpha for the adjusted increased from 0.57 to 0.64.

4.2.2.3.4 Other demographic variables

Control variables for gender, education level (i.e., preliminary-to-intermediate education, undergraduate, master's and higher), prior computer use experience and music expertise level were measured for further analysis. Prior computer use experience was a binary variable (0 – "less extensive computer use at work", 1 – "more extensive computer use at work") that indicated whether the participants used the computer more extensively at work than the median level of usage among all participants in this sample. Results of this question were further coded to the variable "prior computer use experience" using a median split.

Music expertise was only asked in the UK online sample. Music expertise was a binary variable (1 – "lower level of music expertise", 2 – "higher level of music expertise") that indicated whether the participants had a higher level of formal music training (i.e., having a music degree or qualifications, or having received formal singing/instrument training more than the average level of the sample).

4.2.3 Results

The primary aim of this study was to uncover the use of digital music technologies by identifying its latent structure and association with demographics and competence-psychological constructs. The first stage of analysis set out to answer RQ3.1. There are no *a priori* theories about the dimensionality of the underlying structure of the use of digital music technologies among older people. As such, we conducted exploratory factor analysis (EFA)

to obtain the dimensionality of digital music technology use with two samples respectively. The second stage of analysis set out to answer RQ3.2 and 3.3 in this study. We started the second stage with performing correlation analysis between bundled use patterns and sharing frequencies, demographics, and psychological constructs. The association between self-efficacy and music group membership was also examined.

4.2.3.1 RQ3.1: An Exploratory Factor Analysis of Digital Music Technology Use

Cambridge local sample. The scree plot test, parallel analysis, and factor interpretability were used to determine how many factors to retain. A principal-component factor analysis was used to extract factors: we analysed the correlation matrix, extracted factors with eigenvalue over 1, and rotated with the oblimin[36] method. Examination of the scree plot, results of the parallel analysis (see Floyd & Widaman, 1995) and factor interpretability suggested that we retained no more than two factors. The overall KMO (Kaiser-Meyer-Olkin) of all items was 0.81, and Bartlett's test of the correlation matrix showed a significant result ($p < 0.001$), suggesting that our method of analysis was appropriate. One item, "email", was removed after the first iteration because of its low value of communality. The resulting factor structure is presented in Table 4-3. In total, 65% of the variance of the data was explained with the two factors. All the virtual factor loadings on each factor were positive, meaning that both factors were unipolar.

The first factor, "Active interacting", had the highest value of eigenvalue (4.65). It was made up of seven items in relation to digital music technology use: "learn music online", "buy devices for music", "upload music online", "record music", "recommend music to someone", and "search for music online". The four items with the highest factor loadings, "learn music

[36] Oblimin, a type of oblique rotation method, was chosen because prior literature suggested that oblique rotation was appropriate in social science research, as "*in the real world, it is not unreasonable to think that factors, as important determiners of behaviour, would be correlated*" (Kline, 1979, p. 19).

online", "buy devices", "upload music online" and "record music" were explicitly mentioned by many of our participants in the interview (see Chapter 3), which had been described as critical practices for community music learning. Creech, Hallam, Varvarigou, et al. (2013) characterise active music engagement as engaging in activities such as singing or playing music at home or with others, listening and recording music sometimes or often. In line with their work, our findings in Chapter 3 indicate that digital music technologies involved in coordinating these practices, and the situated use of digital music technologies and such practices were not mutually exclusive (see Dourish, 2006). Moreover, participants in the Cambridge local sample had a similar background to that of the interview participants in Chapter 3. To this end, we labelled this factor as "Active interacting". Besides, "recommend music" was included in the Active interacting factor, as it may speak to our qualitative findings on music sharing – one of the key practices of active participation in community music (see section 3.2.3.1). However, it may be that the survey participants' reported usage encompasses their individual music listening and learning practices as well. Therefore, more precisely, this factor was a broad categorisation of music-technology use with a focus on "active music-making" (see Creech, Hallam, Varvarigou, et al., 2013) using digital music technologies.

The second factor, "Contributing" (eigenvalue $= 1.19$), was composed of two items that indicated the social aspects of use: "rate music online" and "comment music online". Although "rate music online" was not explicitly mentioned in our previous findings, it was a contribution-related factor that implied contributing evaluations in relation to music. This factor complements Karnik et al.'s (2013) notion that contribution is an important gratification of media sharing on Facebook. As long as the analysis method was appropriate and factor loadings were all significant[37], we retained the structure with the factor "Contributing" that was made up of two items. However, with only two items, the factor "Contributing" (Cronbach's $\alpha = .74$) emphasised content validity considerations rather than

[37] Except for "search music online". Literature suggests that factor loadings that are larger than $.60$ are salient for a sample of 85, see (Hair, Black, Babin, Anderson, & Tatham, 1998, p. 112)

optimising internal consistency (see also Gosling, Rentfrow, & Swann, 2003), which was always the goal of multi-item scales (e.g., no less than 3 items per factor). Therefore, readers might want to consider this limitation when interpreting the factor structure in this sample.

The results of EFA with Cambridge local sample suggest that there was a clear underlying structure to digital music technology use. Two interpretable factors were identified: Active interacting and Contributing. However, all participants were in Cambridge. Would a similar factor structure be derived among people elsewhere? We then examine the factor structure of use with a different sample – the UK online sample.

Table 4-3 Factor means, standard deviations, and Cronbach's Alphas, and standardised loadings (Cambridge local sample)

Items	M (SD)	Factor Loadings	
		Active Interacting	Contributing
Factor 1: Active Interacting *(*$M = 2.72, SD = 1.01, \alpha = .86$ *,* $eigenvalue = 4.65$*)*			
Learn music online	2.52(1.51)	**.89**	−.10
Buy devices for music	2.12(1.04)	**.88**	−.11
Upload music online	2.15(1.26)	**.76**	−.05
Record music	2.30(1.61)	**.76**	.04
Bookmark music online	2.54(1.67)	**.63**	.30
Recommend music	3.32(1.43)	**.62**	.24
Search music online	4.08(1.51)	**.58**	.27
Factor 2: Contributing *(*$M = 1.94, SD = 1.15, \alpha = .74$ *,* $eigenvalue = 1.19$*)*			
Rate music online	1.90(1.41)	−.02	**.92**
Comment music online	1.97(1.22)	.04	**.82**

Note: Loadings $\geq |.40|$ *are in bold typeface.* $n = 77$*. M – mean; SD – standard deviation.*

UK online sample. We used the same method and procedure as we used in the Cambridge local sample: the principal component factor analysis. Based on the scree plot and the parallel analysis criterion (see Floyd & Widaman, 1995), we set the number of factors to be extracted to 2. The analysis method was appropriate because the KMO (Kaiser-Meyer-Olkin) of the 10 items was $.85$, and the correlation matrix was factorable with a significant result of Bartlett's test ($p < 0.001$). The item "search music online" was removed due to low communality after the first iteration. After the second iteration, 2 factors emerged from the 9 items of use

frequency, with 66% of variance explained. The two factors were named based on the common meanings of the items included.

Factor 1 was labelled "Socialising and Contributing", and it included 2 items in relation to the social aspects of music: emailing for the purpose of music and bookmarking a piece of music online, as well as 2 items in relation to the contribution aspects of music: commenting and rating on a piece of music, which were shared by the Cambridge local sample.

Factor 2 "Active interacting" included 5 items concerning active interaction with music online and offline for various purposes: "recording music", "learning music from online resources", "uploading music", "buying devices for music", and "recommending music to others".

Table 4-4 Factor means, standard deviations, and Cronbach's Alphas, and standardised loadings. (UK online sample)

Items	M (SD)	Factor loadings	
		Socialising & Contributing	Active Interacting
Factor 1: Socialising & Contributing $(M = 2.81, SD = 1.09, \alpha = .80, eigenvalue = 5.07)$			
Bookmark a piece of music online	3.01(1.56)	**.88**	−.11
Comment on music	2.71(1.49)	**.83**	.06
Rate music online	2.45(1.43)	**.80**	.08
Email	3.16(1.45)	**.77**	.04
Factor 2: Active Interacting $(M = 2.59, SD = .85, \alpha = .80, eigenvalue = .88)$			
Record music	2.41(1.34)	−.03	**.87**
Learn music online	2.39(1.37)	−.08	**.82**
Upload music online	2.52(1.63)	.10	**.75**
Buy devices for music	2.52(.99)	.09	**.73**
Recommend music	3.50(1.16)	**.40**	**.45**

Note: Loadings ≥ |.40| are in bold typeface. N=153.M – mean; SD – standard deviation.

Participants' scores on the two factors (in which the relevant item scores were averaged) appear in Table 4-4. The factors were ranked by their eigenvalues (Socialising & Contributing – 5.07, Active interacting – 0.88). Unlike in the Cambridge local sample, the

factor "Socialising & Contributing" ranked higher, indicating that it was perceived to occur more frequently among our participants. The reliability of both factors was above .75, and the construct validity of the model was acceptable.

Taken together, we identified a two-factor structure for the Cambridge local and UK online sample. Active interacting was the main pattern of use shared by both samples: "learn music online", "buy music devices", "upload music", "record music" and "recommend music" were included in this factor for both samples. In terms of the other factor (Contributing in the Cambridge local sample and Socialising & Contributing in the UK online sample), both samples shared the common items of Contributing (i.e., "comment music online", "rate music online"), whilst in the UK online sample, this factor included Socialising-related items (i.e., emailing). The two samples reported different frequencies of performing the two categories of use patterns: Active interacting ranked higher in eigenvalue in Cambridge local sample, whilst Socialising & Contributing ranked higher in eigenvalue in the UK online sample. In other words, local Cambridge participants reported that they used digital music technologies for Active interaction more frequently (e.g., learning, buying devices, and uploading music online). In contrast, participants in the online sample indicated that they more frequently used digital music technologies for Socialising and Contributing (e.g., emailing for music, commenting and rating music online). Moreover, there were a few minor differences in terms of the factor structure across the two samples: (i) e-mailing, an item of Socialising & Contributing in the UK online sample, was not included in the final factor structure in the Cambridge local sample because of its low communality; (ii) the item "bookmark music online" was grouped into Active interacting in the Cambridge local sample but had the highest loading on Socialising & Contributing in the UK online sample. It may be that bookmarking implied both Socialising and Active interacting use in community music contexts. It is also possible that participants in the UK online sample bookmarked music online more often than those in the Cambridge local sample. This resonates with our qualitative findings in Chapter 3, that bookmarking a piece of music online was seldom reported by our interviewed participants, whilst the shared items (e.g., learning music online,

buying music devices, uploading music, recording music and recommending music) were prevalent in participants' reported practices of music sharing and music revisiting.

As a final step to conclude the factor structure of use patterns, we examined the factor congruence (also known as Tucker's congruence coefficient) across the two samples. Results showed that the Contributing (or Socialising & Contributing) factor yielded a higher congruence coefficient (.73), and the Active interacting factor had a congruence coefficient of .60. None of the congruence coefficients was higher than .85, which was the threshold of fair similarity in the literature (see Lorenzo-Seva & Ten Berge, 2006). These results imply that the factor structure of digital music technology use should be replicated with caution. Participants from different backgrounds reported different frequencies in terms of Active interacting use and Socialising (& Contributing) use. It is possible that different age structures in the two samples account for the difference. Another possible reason was that due to missing values, the item "email" in the local sample was detected with low communality and was eliminated from analysis. Dropping different items might lead to different factor loadings. It is also possible that participants in the UK online sample were more technology-savvy than the local participants. To confirm what factors account for the differences, we then move to the next stage of analysis to investigate how demographic and psychological constructs are associated with use (the term "bundled use patterns" will be used to represent the factor structure hence force) and sharing frequencies.

4.2.3.2 RQ3.2: How are demographics and the psychological construct of self-efficacy associated with the use of digital music technologies?

4.2.3.2.1 Demographics correlates

Here we examine the correlation between use/sharing frequencies and demographic variables that include age, gender, education, prior computer use experience, music expertise level and the percentage of expense on music (see Table 4-5). Except for music expertise level and the percentage of expenditure on music, all other demographic data was available for both

Cambridge local and UK online sample, therefore the correlation results of both samples were presented together. Overall, the pattern of correlations between use/sharing frequencies and membership was consistent across the two samples. Having music group memberships (formal or informal) was the variable most strongly related to the bundled use patterns and sharing frequencies in both samples (mean absolute $r = .42$). It was followed by age in the Cambridge sample (columns 1, 3 and 7), and gender (columns 2, 6 and 8), prior computer use experience (columns 2, 4 and 6), music expertise level (columns 2, 6 and 8) and money spent on music (columns 2, 4, 6 and 8) in the UK online sample.

In terms of the Cambridge local sample, except for sharing with music group members, participants who were younger reported more frequent use and sharing with digital music technologies. Among the rest demographic variables, as shown in columns 1, 3, 5 and 7, gender, education level, and prior computer use did not correlate with the bundled use patterns and sharing frequencies in Cambridge local sample.

Table 4-5 Demographic correlates of bundled use patterns and sharing frequencies (in two independent samples).

	Active Interacting		Contributing (Socialising & Contributing)		Sharing within groups		Sharing with family/friends	
	CS	US	CS	US	CS	US	CS	US
Membership	**.46**	**.51**	**.25**	.12	**.61**	**.74**	**.31**	**.35**
Age	**−.46**	−.07	**−.51**	−.16	−.02	−.04	**−.37**	−.06
Gender [Male=1]	.22	**.26**	.02	.04	.23	**.26**	.19	**.21**
Education	−.16	−.17	−.23	−.12	.02	−.08	−.17	−.03
Prior computer use experience	−.17	**.21**	−.20	**.21**	.14	**.20**	−.12	.07
Music level	-	**.26**	-	.12	-	**.26**	-	**.28**
Percentage of money spent on music	-	**.31**	-	**.23**	-	**.24**	-	**.27**

Note: CS = Cambridge local sample (n =77); US = UK online sample (n = 153); – = missing data. Correlations that are significant at $p < .05$ are in bold typeface.

As for the UK online sample, participants with music group memberships (informal or formal) reported more frequent Active interacting use and Sharing with group members. As shown in columns 2 and 6, male participants with more prior computer use experience, a higher music level and who were willing to spend more money on music were more likely to

take up digital music technologies for Active interaction and sharing with group members frequently. Age was not a prominent demographic factor in this sample. Socialising & Contributing use and sharing music with family/friends (column 4 and 8) were associated with a few demographic variables: people with more extensive computer use experiences and with the willingness of spending more money on music reported more frequent Socialising & Contributing uses; male participants with a higher music expertise level reported more frequent sharing with family/friends.

The above analysis shows different correlation patterns between use/sharing frequencies and age. To give readers a better idea of whether late middle-aged and older participants had different use patterns compared to the younger participants, we then proceed to examine, in particular, the associations between use/sharing frequencies and participants' age and employment status for each sample, respectively.

4.2.3.2.2 Association with age, employment status – Cambridge local sample

Having identified the factor structure of digital music technologies usage, we then examine if there were differences between younger and older participants. To make the comparison more straightforward to interpret, we used an approximate median split[38] of age across the two samples – 55 – in this study (the ≥ 55 group, in which participants who were 55 and above, $n = 32$; the < 55 group, in which participants who were younger than 55, $n = 33$). A set of Mann-Whitney U tests were conducted, with computed factor scores of use patterns (i.e., Active interacting, Contributing) and the averaged value of sharing frequencies within music groups and among family/friends as dependent variables (i.e., the averaged sharing frequency within groups, the averaged sharing frequency with family/friends). Mann-Whitney U test was the non-parametric equivalent of the independent *t-test* and was chosen

[38] Median split was only used in demographic and psychological correlates in study 2. The continuous variable age was used in regression models in study 3, as median split might reduce effect size and experimental power (see Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015).

because our data violated the assumption of normal distribution. The test results indicated that both use patterns and sharing frequencies with family/friends differed across the two age groups, except for sharing within groups (see Figure 4-1). In particular, factor scores of Active interacting of the < 55 group (median$= 3.14$) were significantly higher than that of the ≥ 55 group (median$= 2.16$), $W = 833$, $p < .001$, effect size[39] $= -.44$. Factor scores of Contributing of the < 55 group (median$= 2.00$) were significantly higher than the ≥ 55 group (median$= 1.00$), $W = 794.5$, $p < .001$, effect size $= -.39$. The average value of sharing frequencies with family/friends of the < 55 group (median$= 2.75$) was significantly higher than the ≥ 55 group (median$= 1.75$), $W = 767$, $p < .01$, effect size $= -.33$.

As can be seen from Table 4-1, the Cambridge local sample was made up of people who were younger than 40 and had a younger average age (47.0) compared to the UK online sample (average age $= 55.2$). To determine whether this younger segment of data played a significant role in the differences in use patterns between the < 55 and ≥ 55 group, we ran two Kruskal-Wallis tests and *post hoc* comparisons between six age groups (18-24, 25-34, 35-44, 45-54, 55-64, 65 and older). The Kruskal-Wallis test is the non-parametric counterpart of one-way independent ANOVA and was chosen because our data violated the assumption of normal distribution. Results showed that scores on Active interacting differed significantly between the 18-24 group (median $= 3.15$) and the two oldest groups (55-64 and ≥ 65, median $=2.09, 2.31$, respectively); scores on Contributing differed significantly between the 18-24 group (median $= 3.00$) and the two oldest groups (55-64 and ≥ 65, for both, median $=1.00$, see Figure 4-2). Therefore, the youngest age group (aged 18-24) accounted for the significant differences in the bundled use patterns in the Cambridge local sample. Sharing frequencies (within groups and with family/friends) did not show any significant difference between different age groups; we only present the plots of the bundled use pattern here.

[39] Here the effect size was computed based on the method described in Rosenthal (1991), in which effect size $= z/\sqrt{n}$ (z =the z value for the data, n =the number of total observations on which z is based)

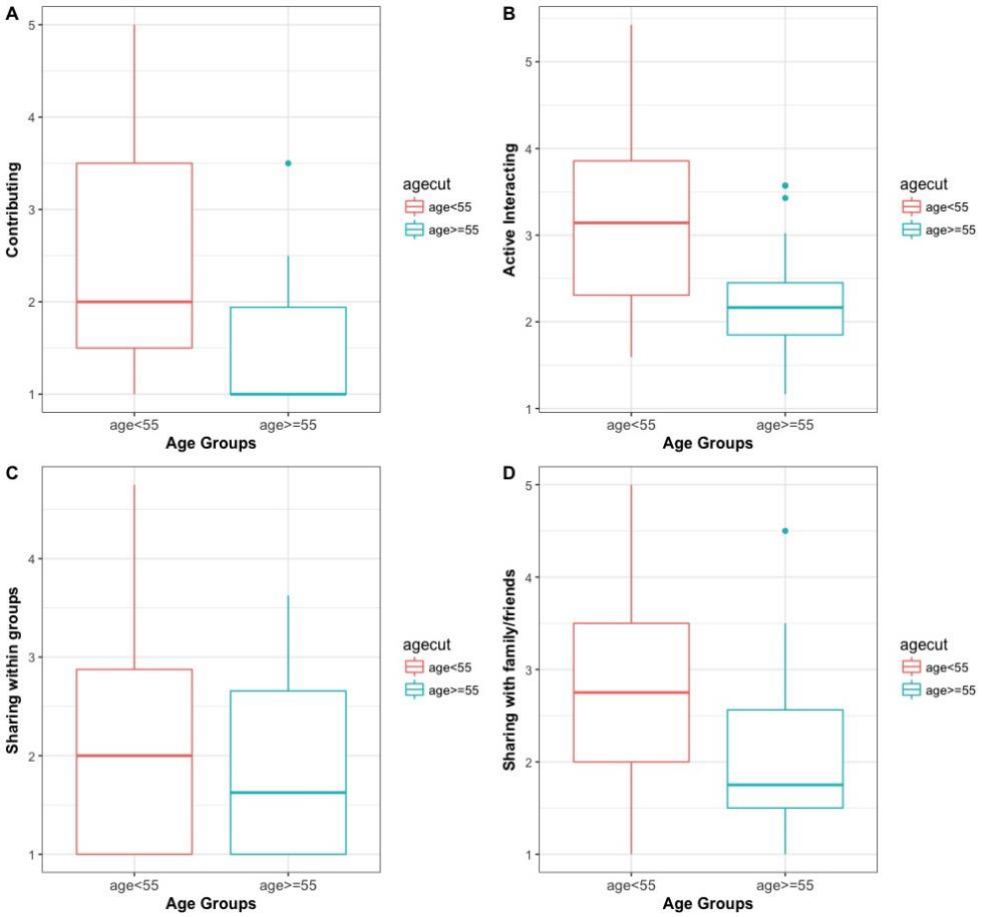


Figure 4-1 Comparison of bundled use pattern scores and sharing frequencies across two age groups (Cambridge local sample)

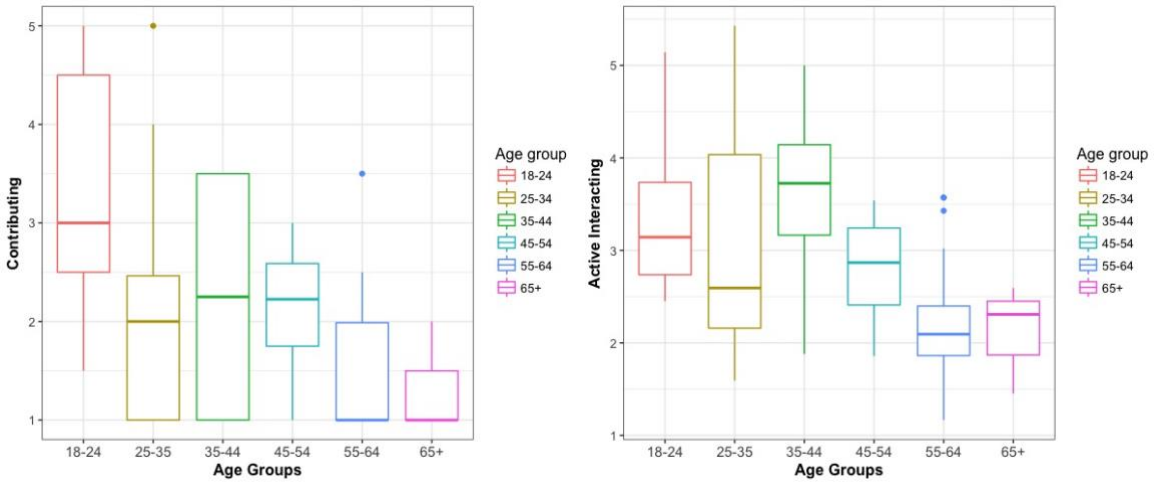


Figure 4-2 Comparison of bundled use pattern scores across six age groups (Cambridge local sample)

We then examined the effects of employment status on the bundled use patterns and sharing frequencies. We conducted a set of Kruskal-Wallis tests with the bundled use patterns (i.e., factor scores of Active interacting, Contributing) and sharing frequencies (i.e., the averaged value of sharing within groups and with family/friends) as dependent variables, and employment status as the independent variable. Overall, similar patterns were found: scores on Active interacting, Contributing and sharing with family/friends differed significantly across different employment statuses ($H(3) = 22.61, 20.96$ and 15.63, respectively; all $p < .01$; effect size $= -.44, -.42, -.34$, respectively), whilst sharing within groups did not show any significant difference across different employment statuses. Pairwise comparison showed that in terms of Active interacting uses, employed participants (median$= 3.23$) reported more frequent use than retired participants (median $= 2.02$). As for Contributing uses, people in employment (median$= 2.00$) reported more frequent use of digital music technologies than retired participants (median $= 1.00$). In terms of sharing with family and friends, participants who were employed (median$= 2.75$) reported sharing music more frequently than those who were retired (median $= 1.75$). Figure 4-3 presents the differences in use and sharing frequencies across different employment statuses.

In sum, in the Cambridge local sample, the younger participants (age < 55) reported more frequent use of digital music technologies in terms of Contributing and Active interacting as well as more frequent sharing practices with family/friends than the older participants (age ≥ 55). Especially for the two bundled use patterns, those who were aged 18-24 accounted for most of the differences between the < 55 and ≥ 55 groups. It may be that there is a cohort difference between the 18-24-year-old "digital natives" who grow up with information technologies and the late middle-aged and older people who are considered as "digital immigrants" (Prensky, 2001). Participants who were still employed reported more frequent use and sharing than people who were retired. However, neither the younger nor older group in our data showed significantly different sharing frequencies within music groups, nor did those who were in employment and retired.

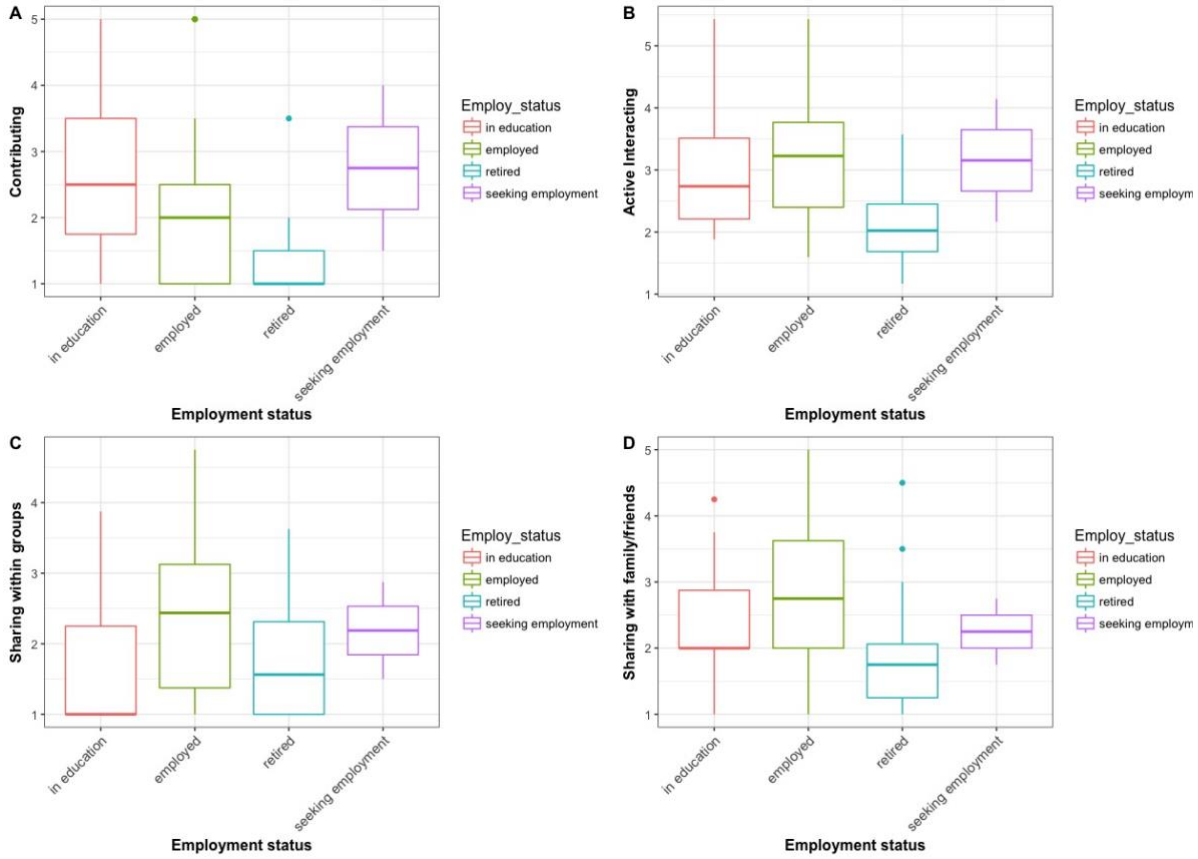


Figure 4-3 Comparison of bundled use pattern scores and sharing frequencies across employment statuses (Cambridge local sample)

4.2.3.2.3 Association with age, employment status – UK online sample

We compared factor scores of the bundled use patterns (i.e., computed factor scores of Socialising & Contributing and Active interacting) across two cohorts using the Mann-Whitney U test. There were no significant differences in the bundled use patterns across the two age groups (age< 55 and age ≥ 55). We also investigated the age differences in sharing frequencies using the same test. Results showed that the two age groups did not have significantly different sharing frequencies within groups ($M = 2.14, SD = 1.20$, Cronbach's $\alpha = .90$) nor with family/friends ($M = 2.18, SD = .99$, Cronbach's $\alpha = .85$) around digital music technologies.

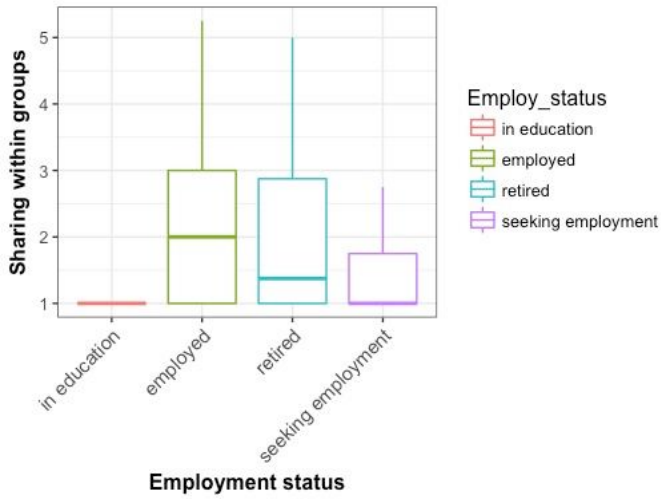


Figure 4-4 Comparison on sharing frequencies within groups in terms of employment status (UK online sample)

In addition, we examined the impact of employment status on the bundled use patterns (i.e., factor scores of Socialising & Contributing and Active interacting) and sharing frequencies (i.e., within group and with family/friends). Employment status *only* showed significant effects on sharing frequencies within groups ($H(3) = 8.10, p = .04$, effect size $= -.14$[40]). However, a further *post hoc* test across different employment statuses showed that the difference in sharing frequencies among those in employment (median$= 2.00$) and those who were retired (median$= 1.38$) was not significant (see Figure 4-4). This observation suggests that even though employment status showed a significant impact on the sharing frequencies within group members, the effect was relatively small. In other words, employment status overall did not influence the bundled use patterns and sharing frequencies significantly. In summary, the < 55 group and the ≥ 55 group in the UK online sample did not show significantly different bundled use patterns and sharing frequencies of digital music technologies. One likely explanation for the different demographic correlation patterns across the two samples is that the segment of participants aged 18-24 in the Cambridge local sample may account for the differences in bundled use patterns. In other words, in both samples, age is a prominent, exclusive factor for the different use patterns and sharing frequencies across

[40] An effect size smaller than $.30$ is considered to be of small effect (see Durlak, 2009).

the < 55 and ≥ 55 age groups. To move forward, we investigate the psychological constructs correlates across the two samples.

4.2.3.2.4 Psychological constructs correlates: self-efficacy and community orientation

To answer the second half of RQ3.2, we started by examining how the bundled use patterns and sharing frequencies were correlated with domain-specific self-efficacy (i.e., general computer-use self-efficacy, music-technology-specific self-efficacy and communication-specific self-efficacy) and community orientation (i.e., collective, segmented and individual orientation).

Self-efficacy. The correlations presented in Table 4-6 revealed a clear pattern of links between the use of digital music technologies and domain-specific self-efficacy. In both samples, as can be seen from columns 1-2, general computer self-efficacy and music-technology-specific self-efficacy were positively correlated with Active interacting uses. It appeared as if Active interacting uses were closely tied to perceived confidence in using the computer in general and taking actions such as transferring music between devices and searching for a piece of music on the Internet.

There was a consistent pattern of correlations between music-technology-specific self-efficacy and sharing frequencies. As shown in columns 5-8, music-technology-specific self-efficacy was positively correlated with sharing within groups and sharing with family/friends in both samples. In other words, individuals who had a higher level of perceived confidence in performing music-technology-related tasks were more likely to share music with others using digital music technologies frequently. In contrast, general computer-use self-efficacy did not present a consistent pattern of correlations in terms of sharing frequencies. Only in the Cambridge local sample we found positive correlations between general computer self-efficacy and sharing within groups. Therefore, it appeared that general computer use self-efficacy was not strongly correlated with more frequent music sharing.

Table 4-6 Psychological constructs correlates of bundled use patterns and sharing frequencies (in two independent samples)

	Active Interacting		(Socialising) & Contributing		Sharing within groups		Sharing with family/friends	
	CS	US	CS	US	CS	US	CS	US
General computer self-efficacy	**.26**	**.25**	**.35**	.16	**.26**	.12	.23	.13
Music-tech self-efficacy	**.29**	**.35**	.18	.14	**.32**	**.21**	**.30**	**.25**
Communication self-efficacy	−.19	.07	.02	.00	.10	.00	.03	−.04
Collective orientation	−.14	**.37**	.15	**.39**	.03	**.48**	−.12	**.26**
Segmented orientation	**.29**	.09	**.27**	−.01	.04	**.21**	.13	.02
Individual orientation	.20	.07	.21	.04	.08	−.10	.08	−.02
Cross-sample Correlation[a]	.46		−.03		.11		.46	

Note: CS = Cambridge local sample (N=77); US=UK online sample (N=153); – =missing data. Correlations that are significant at $p < .05$ *are in bold typeface. [a]Cross-sample correlations were computed using Fisher's r-to-z transformation.*

Finally, there were no consistent patterns of correlations between Contributing (or Socialising & Contributing) uses and general computer-use self-efficacy and music-technology-specific self-efficacy. Only in the Cambridge local sample did Contributing present positive correlations with general computer use self-efficacy. Nevertheless, the patterns of correlations between music-technology-specific self-efficacy and bundled use patterns and sharing frequencies were consistent across the two samples (see row 2). Also, communication-related self-efficacy appeared to be not associated with any pattern of uses or sharing. We only included general computer self-efficacy and music-technology-specific self-efficacy in the rest of this chapter.

Community orientation. Generally, there were no consistent patterns of correlations between uses/sharing frequency and community orientation across the two samples. As can be seen in row 4 in Table 4-6, only in the UK online sample, collective orientation was positively correlated with Active interacting, Socialising & Contributing, sharing within groups and with family/friends. Individual orientation displayed no strong correlations with any of the use/sharing patterns. Segmented orientation in the Cambridge local sample was positively

associated with Active interacting and Contributing use; segmented orientation in the UK online sample was only positively correlated with sharing music within groups.

Generalisability of psychological constructs correlates across samples. As one would expect from the correlation results thus far, the bundled use patterns and sharing frequencies across the two samples did not display a consistent pattern of correlations with respect to psychological constructs. To confirm this, we computed the cross-sample correlations for each use pattern (see the last row in Table 4-6). For each dimension (column), the correlation coefficients in Table 4-6 were transformed using Fisher's *r*-to-*z* transformation, and the correlations between the transformed values of the two samples were computed. Active interacting uses and sharing with family/friends presented relatively most consistent patterns (for both, $r = .46$). However, the cross-sample correlation for Contributing or (Socialising & Contributing) use was low ($r = -.03$). This observation suggests that Active interacting and sharing with friends/family were of modest consistency in psychological constructs correlates across the two samples, whereas Contributing (or Socialising & Contributing) showed no consistency in psychological constructs correlates.

We have briefly mentioned earlier in this section that music group memberships presented strong, positive correlations with more frequent use and sharing using digital music technologies. We then move to RQ3.3 and unpack the associations between music group memberships and use, self-efficacy, and music expertise level in more depth.

4.2.3.3 RQ3.3: How is music group membership associated with self-efficacy and technology use? A finer-grained picture

4.2.3.3.1 Association between membership and use

We have noted in RQ3.1 (see section 4.2.3.1) that music group membership was positively correlated with more frequent use and sharing using digital music technologies, we then examined if music group memberships were associated with use and sharing differently by running a set of Kruskal-Wallis tests and ANOVA in the two samples, respectively.

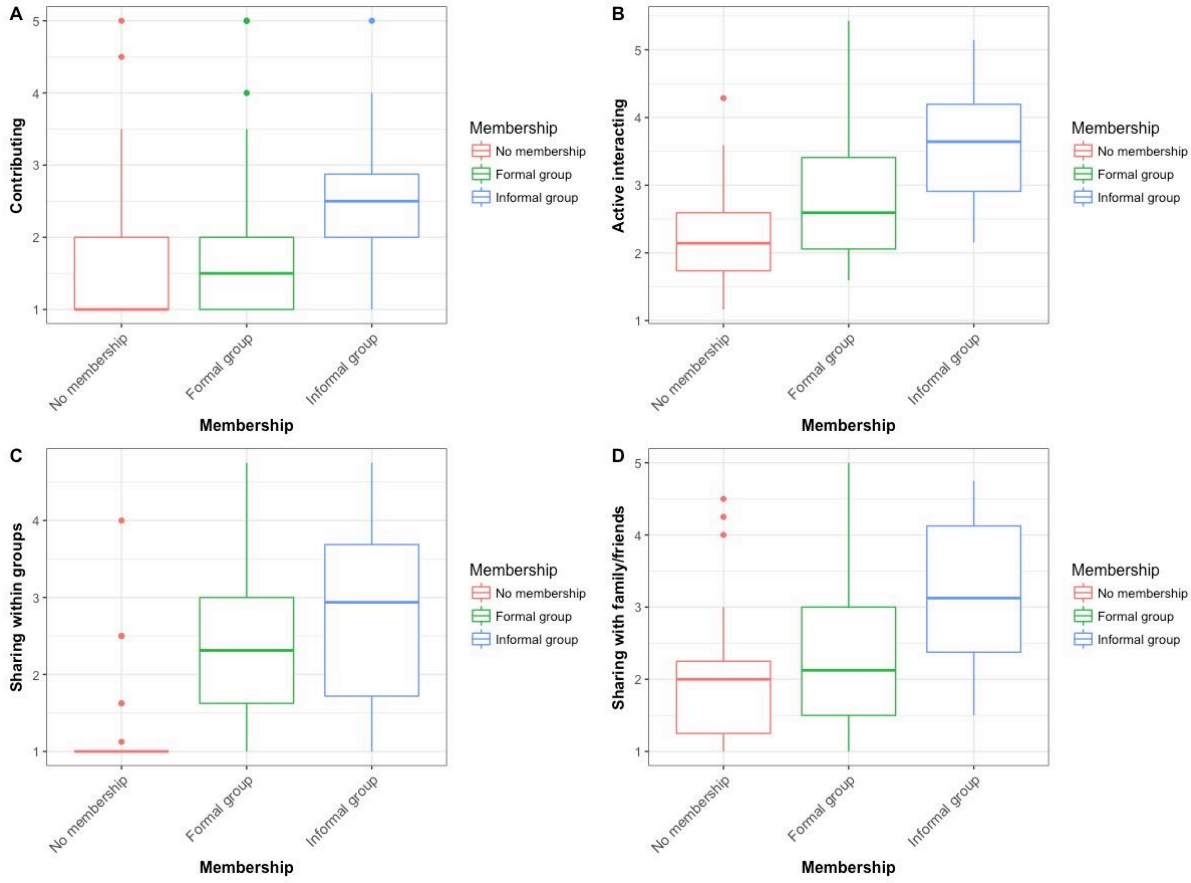


Figure 4-5 Comparison of bundled use patterns and sharing frequencies in terms of membership types (Cambridge local sample)

Cambridge local sample. The results of Kruskal-Wallis tests showed that the frequency of Active interacting, Contributing, sharing within groups and sharing with family/friends were significantly different in terms music group memberships ($H(2) = 16.69, 7.01, 32.22, 8.47$, respectively; for all, $p < .05$). A *post hoc* pairwise comparison indicated that participants with either formal (median= 2.59) or formal (median= 3.64) memberships reported more frequent Active interacting uses, compared to those without music group membership (median = 2.14), whereas formal group members and informal group members did not differ significantly (see Figure 4-5-B). A similar pattern was observed with sharing within music groups (see Figure 4-5-C): participants with either formal group memberships (median= 2.31) or informal memberships (median= 2.94) reported more frequent sharing within music groups compared to non-members. In term of Contributing and sharing with family/friends,

informal group members (median = 2.50, 3.13, respectively) reported more frequent use compared to those with no and formal memberships (median = 1.00, 2, respectively, see Figure 4-5-A and D).

UK online sample. Aligned with the correlation results in section 4.2.3.2, our one-way ANOVA results showed that participants' reported frequencies of Active interacting, sharing within groups and sharing with family/friends presented significant differences in terms of music group memberships ($F(2,149) = 27.05, 88.44, 12.22$, respectively; $p < .01$ for all). Reported Socialising & Contributing uses did differ in terms of different types of membership. This suggests that having music group memberships had an impact on the Active interacting use and sharing frequencies. We then conducted a series of *post hoc* tests with Bonferroni adjustment for pairwise comparisons. In terms of Active interacting use, participants having either formal (median = 2.60) or informal (median= 3.20) membership reported more frequent uses than non-members (median = 2.20); informal group members' Active interacting use frequencies were significantly higher than that of formal group members' ($p < .05$, see Figure 4-6-B). As for sharing within music groups, participants with either formal (median = 3.00) or informal (median= 3.25) memberships reported more frequently sharing behaviour within groups than non-members (median = 1.00); there was no significant difference in sharing frequencies between formal and informal members (see Figure 4-6-C). A similar pattern was found in sharing frequencies with family/friends: people who were members of formal music groups (median = 2.50) and informal groups (median = 2.75) reported more frequent sharing with family and friends compared to non-members (median = 1.88); no significant difference between that of formal and informal members was found (see Figure 4-6-D).

We then ask whether age or membership has a stronger impact on Active interacting and sharing within groups. We discuss this in the two samples separately. The association between membership and Active interacting and sharing was evident in the UK online sample, as the absolute values of correlation coefficients of membership were higher than

other demographic variables (see Table 4-5), and age did not play an important role in influencing uses.

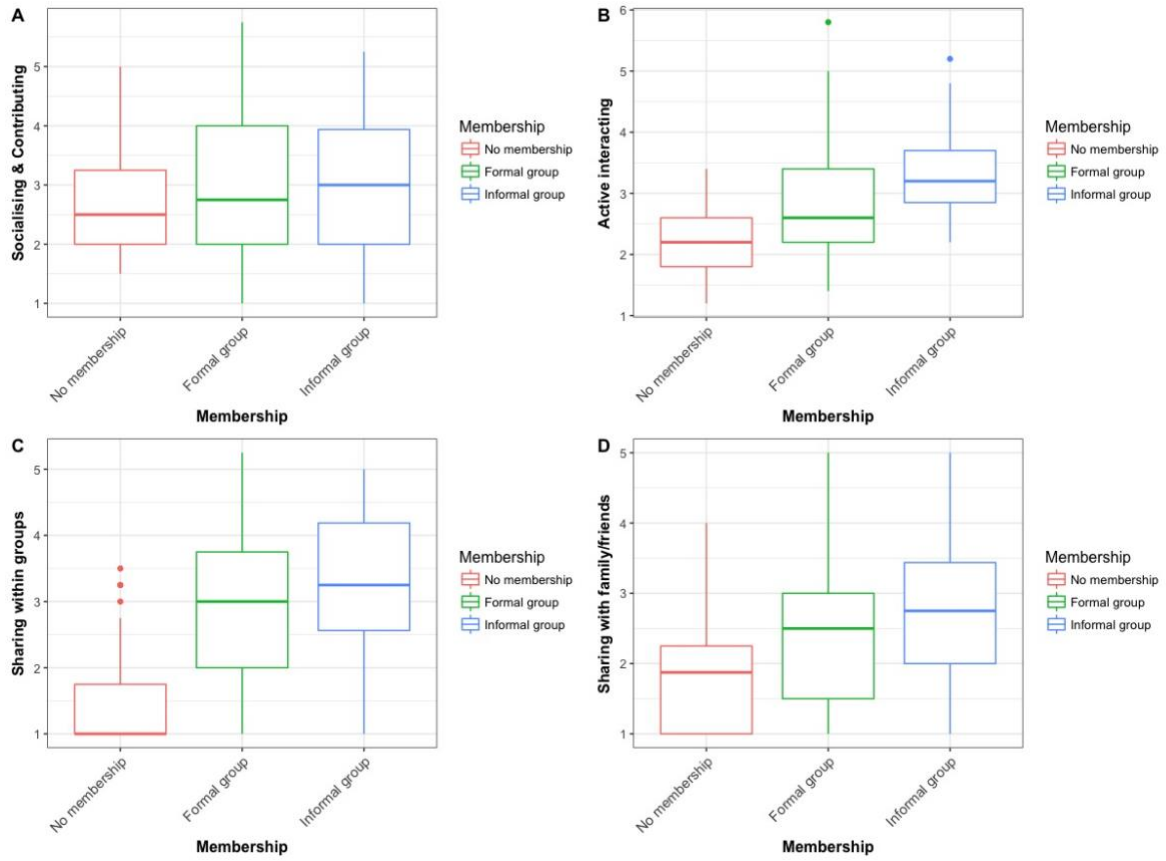


Figure 4-6 Comparison on bundled use patterns and sharing frequencies in terms of membership types (UK online sample)

In the Cambridge local sample, age showed a stronger influence, as a segment of participants aged 18-24 were included. As such, we further investigated if membership explained a statistically significant amount of variance in technology use after accounting for other associated demographic variables (i.e., age, gender and education level). In terms of sharing within groups, age was not strongly correlated, whereas membership displayed strong correlations ($r > .70$). This suggests that sharing music within music groups was prevalent among both younger and older participants. In terms of other use patterns, we conducted a series of multiple correlations to compare the incremental effect of membership. To do so, as the first step, the computed factor scores for the bundled use patterns and sharing with

family/friends were standardised and regressed into three demographic variables – age, gender and education level. At step 2, music group membership was added to the linear model. Results showed that in terms of Active interacting, the multiple correlation coefficient increased from $.33$ to $.50$ after membership was added, and the F ratio for ΔR indicated a significant increase in the proportion of variance accounted for in Active interacting uses. Unsurprisingly, we found no significant increases in the proportion of variance accounted for in Contributing and sharing with family/friends after the variable of membership was entered into the models. Taken together, although age was significantly associated with Active interacting and sharing within groups, having music group memberships (either informal or formal) had a relatively stronger impact on the use of digital music technologies.

In sum, the pattern that having either formal or informal memberships was associated with more frequent Active interacting use and sharing within group members was shared by both samples. In terms of the association between uses and different types of membership, the two samples differed in two ways: (i) in the Cambridge local sample, people who were informal group members reported more frequent Contributing and sharing with family/friends, compared to people who were formal group members; (ii) in the UK online sample, participants with informal memberships reported more frequent Active interacting uses than those with formal memberships.

4.2.3.3.2 Association between membership and self-efficacy

We have noted that general computer self-efficacy and music-technology-specific self-efficacy were associated with digital music technology use and sharing practices differently. We then computed the correlations between having music group memberships and participants' scores on self-efficacy. Correlation results showed that *only* in the Cambridge local sample, music-technology-specific self-efficacy was positively associated with having music group memberships ($r = .25, p < .05$). Neither type of self-efficacy was correlated with group membership in the UK online sample. These results point to the absence of substantial correlations between self-efficacy and music group memberships, suggesting that

general computer-use self-efficacy did not have a substantial effect on the probability of being a member of a music group (43.8% participants in the UK online sample reported having informal or formal music group memberships; see Table 4-1). Given that the measurement of self-efficacy requires domain specificity for accuracy (Bandura, 1997), it is conceivable that belief in being able to accomplish tasks in relation to music technologies is a more appropriate measure than belief in being able to use computers in general. One likely explanation for the effect of music-technology-specific self-efficacy in the Cambridge local sample is that music-technology-specific self-efficacy was contextual and accumulated through participation in community music groups (see Chapter 3), hence participants with music group memberships in the Cambridge local sample tended to believe that they could use digital music technologies to accomplish technology-mediated practices as part of their community music practices. In contrast, since the UK online sample included more people who were technology-savvy and open to new technologies (see also Bonneville-Roussy et al., 2013) than the Cambridge local sample, perceived confidence of using digital music technologies might be relatively high among all participants in the UK online sample, no matter whether they were members of music groups or not. In other words, the different demographics and technical skills across the two samples might account for the differences in the relationship between domain-specific self-efficacy and music group memberships. We will further contextualise the findings concerning self-efficacy with the qualitative data in section 4.2.4.2.

4.2.3.3.3 Association between membership and music expertise

Another provisional conclusion in Chapter 3 is that community music participation was cumulative such that certain levels of music expertise were acquired through participation. Following this argument, formal music group participation is *often* more demanding than informal participation. To further confirm this with our quantitative data, here we introduce a new variable – the intensity of participation – to characterise the differences between formal and informal music groups in terms of the required music expertise. Having formal memberships was coded as 2 (representing the high intensity of participation), and having an

informal membership was coded as 1 (representing the medium intensity of participation), and no membership was coded as 0 to represent no participation. A series of correlation analyses between the intensity of participation and music expertise level were conducted. Results showed that more intensive participation was positively correlated with higher music expertise level ($r = .31, p < .01$), having instrument playing experiences ($r = .28, p < .01$), and emphasising self-growth motivation ($r = .42, p < .01$). In this sense, the categorisation of formal and informal group membership entails a modest estimation of the intensity of participation (see Bukov et al., 2002).

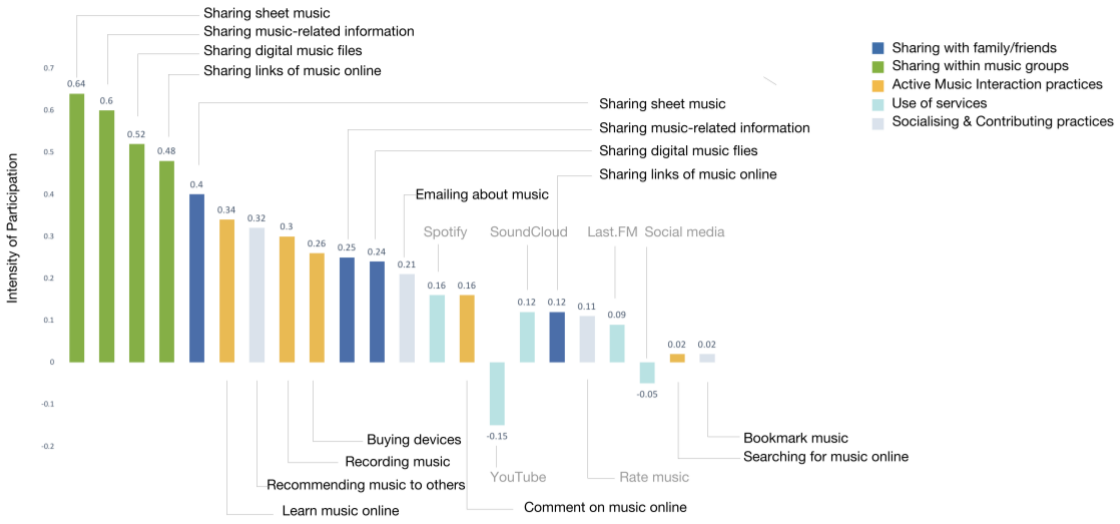


Figure 4-7 Association between the intensity of participation and use patterns. Bars represent correlation coefficients

As mentioned in the demographic correlation results of use/sharing frequencies in the UK online sample (see Table 4-5), the level of music expertise was positively associated with Active interacting uses ($r = .26$, $p < .01$), sharing within groups ($r = .26$, $p < .01$), sharing with family and friends ($r = .28$, $p < .01$) and music group membership ($r = .22$, $p < .05$). We then conducted a correlation analysis that depicted the association between the intensity of participation and all the items on the use and sharing in the survey (see Figure 4-7). As can be seen from this figure, the use and sharing items that were closely tied to community music practices were strongly correlated with the intensity of participation. In particular, the

frequency of sharing within group members was strongly associated with the intensity of participation, followed by a mixture of items representing Active interacting (i.e., learning, recording, buying devices) and Socialising & Contributing (i.e., recommending music to someone else). It should be noted that except for sharing within groups, other strongly correlated use items may entail practices for individual purposes. Therefore, these results should be interpreted with care. However, these results were still helpful because they lent support to our provisional conclusions in study 1, 2 and Bukov et al.'s (2002) notion on the cumulative nature of social participation.

4.2.4 Discussion

4.2.4.1 Summary of findings

The first aim of this study was to specify a factor structure of the bundled use patterns around digital music technologies. With two samples and two EFA models, the results converged to reveal the patterns of digital music technology use: Active interacting and Contributing (or Socialising & Contributing). Each pattern was made up of uses that may involve different technologies but share similar meanings. In terms of Active interacting that covered more diverse and broader use of digital music technologies, it entailed practices such as getting access to resources for learning music, recording music for learning and revisiting purposes, and buying devices for music. These practices correspond to the music revisiting practice that has been identified in Chapter 3. In terms of Contributing (or Socialising & Contributing), it conveyed intentions of sharing feelings and opinions about music (for the UK online sample), which partly echoed the music sharing practice reported in Chapter 3. The factor Contributing (or Socialising & Contributing) also included items of contributing comments and evaluations of music online (for both samples). Although not all participants in the two survey studies were community music group members, the identified dimensionality of uses, at least among participants with music group memberships, lends further support to findings in Chapter 3, that music sharing and revisiting are typical practices for community music. Given that participants in the two samples reported different use patterns, the factor structure

of the bundled use patterns should be interpreted with care and with the consideration of situated contexts and individual differences.

The second aim of this study was to provide an initial examination of the relationship between the use of digital music technologies and different community music memberships, demographic variables, and competence-related psychological constructs (i.e., domain-specific self-efficacy). The results indicate that the bundled use patterns and sharing frequencies (i.e., within groups and with family/friends) were correlated *moderately* with age and *strongly* with having community music group memberships. The bundled use patterns and sharing frequencies were uniquely correlated with music-technology-specific self-efficacy and general computer use self-efficacy. In the two independent samples, the patterns of correlation between music-specific self-efficacy and use/sharing patterns were similar: a higher level of music-specific self-efficacy was associated with more frequent Active interacting uses and sharing within groups and with family/friends. General computer-use self-efficacy only showed positive correlations with Active interacting uses across the two samples. Overall, the use of digital music technologies was not determined exclusively by age, employment status, gender, and education, but also by music group memberships and competence (i.e., self-efficacy). The survey data should be understood and contextualised alongside our qualitative data in the previous chapter. The findings of the effects of music group memberships and music-technology-specific self-efficacy further confirm our propositions with respect to social practice theory, that technologies (and possessions as well) sustain community music practices by keeping a dynamic relationship between *having* and *doing* (Shove, 2007). Especially in the case of "new[41]" technology, digital music technology legitimates its use as an element of the existing music practices, through which the linkage between technology and competence is reproduced and reconfigured. In the next section, we proceed with contextualising our survey findings of self-efficacy with the situated use of digital music technologies.

[41] Similar to what we have noted in Chapter 3, here "new" means relatively new to the older population rather than technological innovations that were seldom known by the general public.

4.2.4.2 Self-efficacy and technology use: contextualising the survey findings

The most theoretically interesting feature of the data is concerned with the association between technology use, music group memberships and music-technology-specific self-efficacy. Given that meaningful participation in community music is cumulative, practical knowledge that is co-dependent on the practices of community music accumulates through participation (see Chapter 3). As digital music technologies can be seen as one of the elements that constitute community music practices (see Chapter 3), the practical knowledge of using these technologies accounts for a segment of knowledge for community music participation as well (see Shove et al., 2012). Moreover, technology use for community music showed different patterns between those with and without music group memberships: in both samples, digital music technologies were used more frequently (i.e., Active interacting and sharing within groups) among participants who participated in music groups. Unsurprisingly, our survey data in study 3 lent support to this proposition. Also, informal group participants reported the most frequent use and sharing using these technologies, followed by formal group members. One likely explanation could be drawn from the findings in study 1 (see section 3.1.3.3), that participants formed collective identifications that were congruent with the collective identities of their groups through successive participation. Informal groups, compared to formal groups, were more likely to emphasise relational activities and social connectedness. Also, given that formal music group participants often had a higher level of music expertise, formal group members tended to rely on digital music technologies for music learning less frequently than informal group members. To this end, the use of digital music technologies for community music participation might be more frequently reported among informal group members, compared to formal group members. This adds to the emerging HCI literature inspired by the situated action approach (e.g., Comber et al., 2013), by implying that the use of digital music technologies among our participants was contingent on their everyday routine, practices, and identities. Moreover, by confirming the qualitative findings on memberships and usage with the survey data, our findings contribute to the

literature on music technology use by providing concrete and situated contexts of use, instead of focusing on music listening in general. Although from the survey data we cannot distinguish the use of technologies for individual purposes (e.g., learning to play an instrument online by oneself) and group purposes, our data, at a modest level, suggests that group memberships were associated with more frequent use (i.e., sharing within groups and Active interacting) of digital music technologies.

As mentioned in Chapter 3, competence accumulated in the form of confidence and efficacy in using digital music technologies. In this chapter we chose self-efficacy as a dimension of competence. In the case of using digital music technologies, the correlations between music-technology-specific self-efficacy and technology use were strong in terms of Active interacting, sharing within groups, and with family/friends (see Table 4-6), whilst no strong correlations were found in terms of Contributing (or Socialising & Contributing). However, when comparing the correlation coefficients of music-technology-specific self-efficacy and other demographic variables, the effect of self-efficacy was relatively small (the correlation coefficient r ranging from $.21$ to $.35$, compared to the correlation coefficient r of membership that ranged from $.25$ to $.51$). That is, although self-efficacy of using digital music technologies for community music participation was theoretically important and evident in our previous qualitative data, the quantified impact of self-efficacy on technology use were not apparent in the survey data and as it is suggested in the literature. We are not suggesting that self-efficacy is not important. As mentioned in the literature review (see section 2.4.4.3), agency beliefs of using digital music technologies may help with participation in community music, the realisation of self-growth or relational goals (see section 3.2.3.2) or even the development of new skills (Vines, 2011). Therefore, even if music-technology-specific self-efficacy did not show substantial effects on the self-reported use of digital music technologies, our work points to the qualitative importance of domain-specific self-efficacy in technology uptake. However, our data is not able to fully differentiate the effects of music-technology-specific self-efficacy and that of age on technology usage. It may be that our measures of music-technology-specific self-efficacy, although more specific than general computer-use, still lack specificity, as we wanted to cover various technological

devices with shared meanings of technology-mediated community music practices. Such measurement of self-efficacy is sufficient for this present study's objective, since this is a modest level of estimation of participants' self-efficacy in using digital music technologies that confirms our previous findings of the linkage between self-efficacy and technology use. However, the lack of specificity may introduce measurement error to self-efficacy. Future research that gathers more specific information about domain-specific self-efficacy in digital music technology usage would be of help in addressing this limitation.

In sum, the results of this study further confirm our qualitative findings on the situated use of technology. The association between the bundled use patterns and music group memberships suggests the importance of contexts and the meanings inherited in learning to *use* technologies and practices (*doing*), with which people incorporate technological tools into their daily routine and thereby reinforce the meanings of using these technologies. This interpretation points to individuals' motivations, attitudes and values, as well as their associations with *doing* – community music practices and technology use. These findings lead us to further examine, in the next study, whether those who are actively motivated to use and those who are passively adopting digital music technologies show any difference in the use of digital music technologies.

4.3 Study 3: Understanding the Use and Motivation of Digital Music Technologies among Middle-aged and Older Adults

This study set out to answer the fourth research question of this dissertation: **How do motivations influence the use of digital music technologies, and how are motivations associated with age and group memberships**?

4.3.1 Background

Despite the bulk of evidence on motivations and use of technology in general, only a few studies provide quantitative evidence on what motivating factors predict listening practices on social media, the choice of listening devices, and the use of playlists (Krause & North, 2014; Krause et al., 2014). Although a few previous studies provide qualitative evidence of the use and motivation of online media systems (e.g., online video creation by Ferreira et al., 2017), and blogging (e.g., Brewer & Piper, 2016), it remains unclear how the elderly would be motivated to use digital music services for their routine and social activities (Krause, North, & Hewitt, 2015). Our findings in study 2 suggest that motivating factors play a role in the situated use of digital music technologies. Taking findings in study 1 and 2 together, the social identification of being a member of music groups is connected to music sharing and revisiting practices. This present study utilises the Uses and Gratifications approach and social identity theory to study motivations of the use of digital music technologies. Uses and Gratifications (U&G) theory examines how people use media to meet their psychological and social needs (Katz et al., 1973). Social identity theory concerns the mechanisms of the development of shared identities, through which people prescribe and evaluate who they are, how others see them, and how they should behave (McKeown, Haji, & Ferguson, 2016; Tajfel, 2010). To test the role of these theories in explaining technology use and collective identity, we ask the following sub-questions:

- **RQ4.1: How are U&G motivations associated with the use of digital music technologies?**
- **RQ4.2: How are U&G motivations associated with the probability of being a member of a music group?**
- **RQ4.3: For music group participants, how are U&G motivations associated with the probability of being users of digital music technologies?**

This study aims to contribute a nuanced picture of the situated use of digital music technologies among middle-aged and older people, and to specify how individual and social

motivations affect uses, and how these motivations are associated with age and social identification as a music group member. As mentioned in Chapter 2, we wished to address the gap between the theoretical motivating factors and the situated practices of community music by contextualising the quantified effects of motivations with our qualitative findings from Chapter 3. The overall objective here is to be specific about the heterogeneity of the ageing population and be sensitive to their situated needs and motivations.

4.3.2 Methods

4.3.2.1 Participants

Drawing upon the same survey that we used in study 3, this study focused on the segment of data concerning motivating factors, which was only available in the UK online sample. As mentioned before, the survey distributed online was an updated version of that distributed locally. The potential importance of motivations emerged from the analysis of the locally distributed survey. Also, to address the limitation of including younger participants in the locally distributed survey, the online version only targeted those who were older than 40 and set out to investigate the differences between middle-aged and older participants in terms of use and motivation. The details of the demographics of this sample can be found in Table 4-1 in study 3. Figure 4-8 presents the distribution of age (A) and music group memberships (B) by gender of this sample.

Unlike the Cambridge local sample, we did not have the opportunity to conduct observational studies nor meet some of our participants in person. In order to get a richer understanding of their motivations of joining a community music group, a ranked survey question was used in the online sample. Participants were asked to rank the four items that best describe their motivation of joining music groups: *for the enjoyment of music*, t*o become a better musician*, *for general enjoyment of music*, and *for making friends*. We computed the average weighted scores for each item based on the ranking results of each participant. The most highly ranked motivation of joining a music group, is *for the enjoyment of music*, followed by *general enjoyment*. This observation unsurprisingly echoes the local sample's nature (see Chapter 3):

4.3 Study 3: Understanding the Use and Motivation of Digital Music Technologies among Middle-aged and Older Adults

45% participants in the interview study mentioned that they joined community music for the enjoyment of group music-making, and only 20% mentioned the self-development goals for participating in community music. Figure 4-9 shows the weighted scores of the four motivation items, from which we found that the desires of becoming a better musician and making friends were ranked lowest.

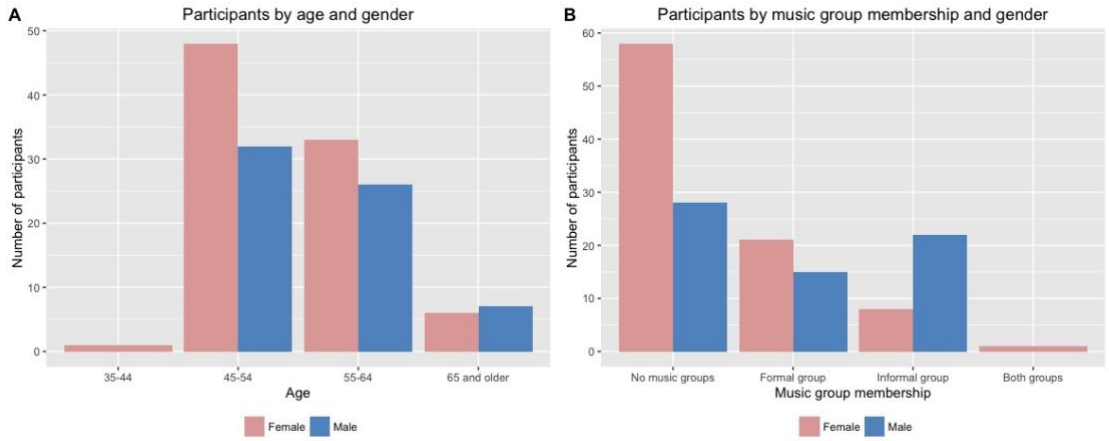


Figure 4-8 Participants demographics

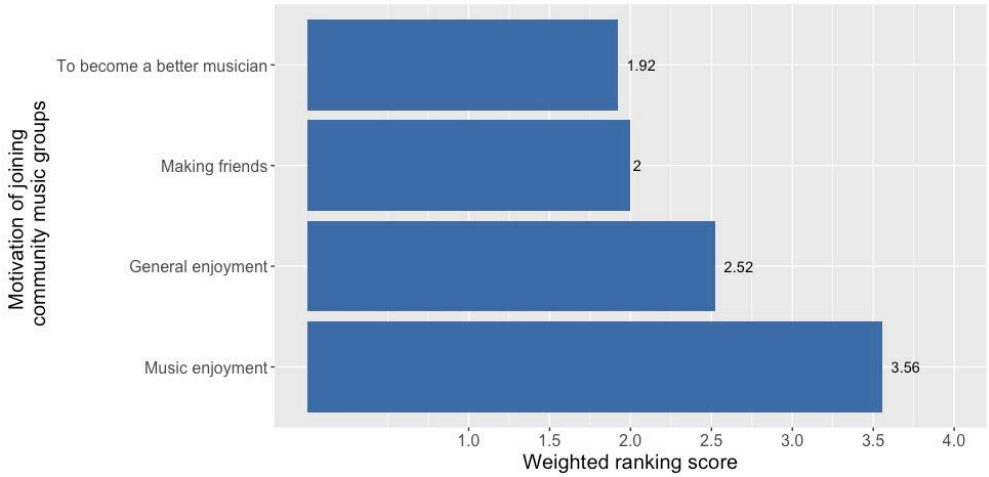


Figure 4-9 Motivation of joining community music group, ranked by weighted scores (n=67)

4.3.2.2 Design of the survey

The computed factor scores of the bundled use patterns and the average scores of sharing frequencies in study 3 were used as dependent variables in this study. As we have mentioned, the items of use and sharing practices were not restricted to one or some specific online music services, unless explicitly indicated, and were grounded in our earlier qualitative findings in Chapter 3. It is also important to note that the use and sharing items in our survey represent participants' impressions of their past and present activities, rather than behavioural data.

The independent variables in this present study were associated with theories above and measured with Likert scales:

Uses and Gratifications, with which 6 items were adapted from two dimensions of the U&G theory: social connectedness (3 items) and information seeking (3 items). All items asked: "Using music streaming services has enabled me to …" and were measured on a 7-point Likert scale. Items of social connectedness included "strengthen my relationship with friends", "strengthen my relationship with family", "feel influential". Items of information seeking entailed "keep up with relevant music events", "learn a lot about music", and "feel confident with Information Technologies". It is important to note that the two U&G dimensions measured in this study were not exclusive. A participant can be motivated to maintain social relationship and keep updated with information at the same time. The reliability of both dimensions (see Table 4-7) was above the suggested threshold 0.60, which was sufficient for exploratory research (Hair, Black, Babin, Anderson, & Tatham, 1998). A factor analysis was conducted to verify the dimensions (see Table 4-7).

This study included self-efficacy and demographic variables as control variables. As mentioned in study 2, we measured the general computer use self-efficacy (Compeau & Higgins, 1995; Taylor & Todd, 1995) (4 items) and music-tech-specific self-efficacy (4 items) with a series of 11-point scales (the percentage of confidence from 0 to 100%). Control variables for gender, education level, and music expertise level were measured as well. Music expertise was a binary variable indicating whether the participants had a higher-

level formal music training (i.e., having a music degree or qualifications or having received formal singing/instrument training more than the average level of the sample).

Table 4-7 Means, standard deviations, Cronbach's Alphas and correlations of psychological constructs

	M (SD)		α	2. r	3. r	4. r
	Age < 55	Age ≥ 55				
1.General computer self-efficacy	74.84 (18.55)	69.92(19.69)	.65	$\mathbf{.75}^{***}$	$\mathbf{.25}^{**}$	.08
2.Music-tech self-efficacy	71.02 (24.55)	64.01(25.06)	.85		$\mathbf{.32}^{***}$	.10
3.Information seeking	4.60(1.37)	4.10(1.59)	.90			$\mathbf{.69}^{***}$
4.Social connectedness	3.26(1.35)	3.04(1.46)	.83			

*Note: * $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$. All items in 1 and were measured with a 11-point scale from 0% to 100%. Items in 3 and 4 were measured with a 7-point Likert scale. All item scores were standardised before factor analysis. Correlations significant at $p < .05$ are in bold typeface.*

4.3.3 Results

To answer RQ4.1, we investigated how motivations influenced bundled use patterns and sharing frequencies. To answer RQ4.2 and 4.3, we started by examining the macro-level differences between those who participated in music groups and those who did not, and then analysed the heterogeneity in the group with music group memberships.

4.3.3.1 RQ4.1: Motivations influence on use patterns

We first examined how the sharing frequencies and the bundled use patterns (computed in study 2) were related to different motivating factors. The four columns in Table 4-8 represented four multiple linear regressions using use patterns and sharing frequencies as outcomes respectively. Factor scores of "Active Interacting" and "Socialising & Contributing" and the averaged item scores of "sharing within groups" and "sharing with family and friends" were used as dependent variables. Socialising & Contributing did not show any significant results, and we did not use it in further analysis in this section. All regressions adopted the same set of independent variables. All coefficients in the models were standardised in Table 4-8.

The most essential purpose of Actively interacting with music and sharing music was to maintain social connectedness. Positive values of standardised β indicated that the stronger

the social motivation was, the more frequently participants interacted with music. Surprisingly, the value of music-related information seeking did not play a significant role in Active interacting nor sharing with digital music technologies. It was possible that participants came to digital music technologies in support of their music practices and stay connected with others, while attempting to learn about information around music by themselves or via conventional channels (i.e., email, face-to-face communication; for example, see Sayago et al., 2012).

Table 4-8 Motivations influence on use and sharing

	Share within groups	Share outside groups	Active Interacting	Socialising & Contributing
(Intercept)	1.32	1.22	1.43 *	2.13 *
Formal membership	1.00 ***	.25	.43 **	.16
Informal membership	9.52 ***	3.64 *	6.41 ***	.88
Age	−.01	−.01	.00	−.01
Gender	.09	.09	.03	−.03
Edu [undergraduate]	−3.18	−3.03	−6.80 *	−4.96
Edu [master's or higher]	−6.27	−5.11	−9.13 *	−6.57
GC self-efficacy	.00	.00	.00	.00
Music self-efficacy	.00	.01	.01	.00
Music expertise	.34 *	.73 ***	.58 **	.26
Information seeking	.01	.00	.04	.10
Social Connectedness	.87 *	1.26 *	1.02 *	.97
Adjusted R^2	.60	.25	.41	.15
F (11,141)	21.43 ***	5.58 ***	10.62 ***	3.46 ***

*Note: * $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$. All coefficients were standardised β. Female, 'A level or lower' education level participants were coded zero.*

None of the demographic and control variables, except for music expertise and education, showed significant effects on use and sharing. A higher level of music expertise was associated with more frequent sharing and Active interacting with music. A higher education level correlated with less frequent Active interacting with music. Interestingly, participants with music group memberships perceived themselves interacting with and sharing music more frequently. The β of informal membership was larger than that of formal membership in all three cases. How do informal and formal group members differ from each other? In the next section, we proceeded with examining how motivations influence group memberships.

4.3.3.2 RQ4.2: Motivations influence on memberships

We investigated the influence of motivations on memberships by conducting a multinomial regression (see Table 4-9). The outcome variable has three levels: no membership, having a formal membership, and having an informal membership. The level 'no membership' is treated as the reference level. All Likert scale ratings were standardised before being entered into the model.

Table 4-9 Motivations influence on membership

	Informal membership		Formal membership	
	$\boldsymbol{\beta}$	OR	$\boldsymbol{\beta}$	OR
	95% CI (LB-UB)		95% CI (LB-UB)	
(Intercept)	−5.44	.00 *	−7.92	.00 ***
	(.00, .46)		(.00, .02)	
Age	.04	1.04	.08	1.08 *
	(.97,1.13)		(1.01,1.16)	
Gender	1.47	4.33 **	.33	1.40
	(1.45,12.94)		(.52,3.77)	
Edu [under-graduate]	− .33	.72	.30	1.34
	(.23,2.20)		(.46,3.92)	
Edu [master's or higher]	− .59	.55	.56	1.74
	(.15,2.00)		(.56,5.43)	
GC self-efficacy	− .38	.68	−.33	.72
	(.31,1.50)		(.36,1.45)	
Music self-efficacy	.94	2.55 *	.38	1.46
	(.99,6.56)		(.68,3.13)	
Music expertise	.87	2.40	1.55	4.70 **
	(.88,6.55)		(1.87,11.82)	
Information seeking	− .81	.45 *	−.14	.87
	(.20,0.99)		(.46,1.63)	
Social Connected	1.20	3.31 **	.52	1.67
	(1.61,6.80)		(.92,3.04)	
McFadden R^2	.19			

*Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. OR: odds ratio. Confidence Intervals (CI): LB=Lower Bound, UB = Upper Bound. Female, 'A level or lower' education level participants were coded zero.*

Social motivation and information motivation were strong predictors of membership of informal music groups. Participants who valued social connectedness were 331% more likely to be an informal music group member. However, participants who were motivated to seek information about music were 45% less likely to be a member of informal groups. Gender and music-technology self-efficacy were significantly associated with being an informal

music group member. The positive and significant effect of gender on informal membership might be associated with the structure of the sample (see Figure 4-8): the number of male participants who attended informal groups was almost twice as many as that of female participants. There were no cohort effects on informal group membership.

Neither social nor information motives predicted formal music group membership. Two control variables, age and music expertise, were significantly associated with holding a formal membership. Music expertise had the largest odds ratio – participants with formal music training were 470% more likely to be a member of formal music group. It implied that rather than being motivated to seek information and remain socially active, participants with more advanced musical expertise had a higher possibility of being a formal group member. This resonated with our qualitative findings that formal and informal group participants had different levels of music proficiency, which might be the effect of the different standards of music aspiration of the groups (i.e., informal and formal music groups) or individual interests and gratifications. We will contextualise this further in the discussion section.

4.3.3.3 RQ4.3: User identification of music group participants

We then investigated the heterogeneity of participants by breaking the sample into a "member group" and a "non-member group". Participants with either formal or informal group memberships were grouped in the "member group". Three logistic regressions were conducted to study the influence of motivations on user identification of two popular digital music products: YouTube and Spotify. With the "member group", three binary dependent variables were used in the regressions respectively: "users of both YouTube and Spotify" (Y&S in Table 4-10, 1 - being users of both YouTube and Spotify, 0 - not using neither YouTube or Spotify), "YouTube users only" (1 – being YouTube users, 0 – not being YouTube users), and "Spotify users only" (Spotify in Table 4-10, 1 – being Spotify users, 0 – not being Spotify users). Results of "YouTube users only" were not reported in Table 4-10, as only marginal effects were found. All coefficients were standardised in Table 4-10.

Of the two motivations, only social connectedness was significantly associated with the identification of Y&S and Spotify users only. A positive β indicated that participants who value social connectedness were 260% more likely to identify themselves as both YouTube and Spotify users, and were 285% more likely to identify themselves as Spotify users. We further tested the effect of motivations on user identification of YouTube and Spotify with the informal membership group, the formal membership group, and the non-member group respectively. No significant results were found in the non-member group membership sample. However, social motivation was significantly associated with the identification of Y&S user and Spotify user in the informal membership sample. This further confirmed findings in 4.3.3.1 and 4.3.3.2 that those who wished to maintain social connectedness with others were more likely to be a member of informal groups and identify themselves as users of these digital music products. This observation is unsurprising because YouTube and Spotify have been regarded as socially connected and accessible products (Liikkanen & Åman, 2015). Prior research on YouTube use among the elderly shows that older adults are passive consumers rather than contributors of YouTube (Sayago et al., 2012). Our findings imply that the use and motivation of YouTube and Spotify were dependent on contextual and social factors, such as whether the use was related to group activities. The interrelation between group membership and use will be discussed further with the prior qualitative findings in the discussion section.

Information seeking did not play a big part in user identification of YouTube or Spotify. We only found marginal effects of information seeking on YouTube only user identification (Odds ratio $= .44, CI = [.17,1.03], p < 0.1$). One explanation was that our participants who were members of music groups did not rely on digital music services to seek music-related information. Likewise, self-efficacy did not correlate with the probability of being a Spotify or YouTube user among music group members.

Table 4-10 Motivations influence on user identification ("member group" only)

	Y&S		Spotify	
	$\boldsymbol{\beta}$	OR	$\boldsymbol{\beta}$	OR
	95% CI (LB-UB)		**95**% CI (LB-UB)	
(Intercept)	−.43	.01	−.12	.02
	(.00,4.93)		(.00, 19.01)	
Age	−.16	.99	.13	1.01
	(.91,1.08)		(.92,1.11)	
Gender	−.16	.85	−.23	.80
	(.20,3.66)		(.18,3.49)	
Edu [under-graduate]	.27	1.19	.81	1.67
	(.26,5.52)		(.37,8.03)	
Edu [master's or higher]	25.43	1.93	28.63	2.10
	(.41,9.79)		(.45,10.80)	
GC self-efficacy	.27	1.01	−.97	.98
	(.95,1.07)		(.92,1.03)	
Music self-efficacy	.00	1.00	.02	1.02
	(.96,1.06)		(.97,1.07)	
Music expertise	1.01	1.46	−.65	.79
	(.36,6.15)		(.18,3.18)	
Information seeking	.30	1.11	.15	1.06
	(.59,2.15)		(.56,2.02)	
Social Connectedness	14.04	2.60 **	15.45	2.85 **
	(1.45,5.13)		(1.56,5.82)	
Hosmer & Lemeshow R^2	.25		.24	

*Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All coefficients were standardised β. Confidence Intervals (CI): LB=Lower Bound, UB = Upper Bound. Female, 'A level or lower' education level participants were coded zero.*

4.3.4 Discussion

4.3.4.1 Motivations and digital music technology use

One consistent trend across the data above concerns the relationship between participants' motivation of maintaining social connectedness and their perceived use patterns of digital music technologies. The exploration of use patterns in study 2 pointed to a set of Socialising & Contributing uses around music-related activities (i.e., comment, rate, email about music, and email only applied in the UK online sample). Moreover, we found that the motivation of social connectedness was significantly associated with more frequent perceived use and sharing with digital music technologies. Interestingly, among music group participants, social connectedness was a strong predictor of whether the participants regarded themselves as

Spotify (or YouTube) users. Taken together, participants identify themselves as digital music technology users and use these technologies more frequently to maintain social connectivity.

Information seeking did not seem to be a strong motivation in the overall data. However, it could be important to some set of participants. In our analysis in 4.3.3.2 (see Table 4-9), information seeking was negatively associated with the likelihood of being a member of informal music groups. Prior studies with younger participants suggest that YouTube could be appropriated as a supporting tool and information hub for those who practice music (Kruse & Veblen, 2012; Liikkanen & Åman, 2015). However, our results with middle-aged and older adults did not confirm these findings. One explanation resonates with Sayago et al.'s (2012) study, that older adults rely more on conventional communication channels (e.g., face-to-face and email) for getting and sharing information. In groups with stronger focuses on social gathering (i.e., informal music groups in our case), people were more likely to account on their groups for information, as it had been implied in the group norms.

The quantitative data should be interpreted and contextualised alongside the ethnographic and interview data obtained from Chapter 3 and related literature (e.g., Brewer & Piper, 2016; Morreale et al., 2017). As concerns the motivation of social connectedness, interviewees reported how they were "recruited" to local community music groups via established social networks. As one interviewee put it: "*This [name of the informal singing group] is much more like a process, about people being included, their voices being … more as a sense of community and singing for the moment*" (P11 in Chapter 3). When discussing the experiences of participation, they also reported their "social" encounter with cloud technologies and streaming services that were new to them. For example, one participant noted the "social pressure" of using YouTube (see quotes of P04 in section 3.2.3.2).

As concerns the experiences of learning, listening to music and performing in informal or formal music groups, our participants spoke of their awareness of streaming technologies and of how their early adoption was related to a sense of competence:

> "I've heard of [SoundCloud] from [name of the group leader]. I know what streaming is. I am very proud, since we are streaming. So, somebody uploaded that [music] onto [the site] … and then you could just play it." (P02)

Our prior interview data confirmed the explanation above with regard to the relationship between information motive and technology use. Being informed via word-of-mouth and conventional means of communication (i.e., "online conversations via e-mail") is common among music group members. Our findings confirmed what Sayago et al. (2012) found about YouTube use among a group of senior citizens in a computer clubhouse. Also, the functionality of discovering music provided by digital music services was not well recognised among our participants. In the interview data the participants tended to discover music in conventional ways (i.e., listening to the music programme on the radio) and word-of-mouth from their singing group leaders and performing repertoires. For example, one interviewee mentioned that she occasionally got ideas of what music to purchase when she went to "*some workshops during which the leaders were selling CDs*" (P02 in Chapter 3). As such, our data and the triangulation with prior qualitative findings address the criticised validity of the U&G approach (Severin & Tankard, 2001; as cited in Ruggiero, 2000) by contextualising U&G motivations in situated use of technology and activities.

4.3.4.2 Group membership and social identity

Our data points to the influence of music group memberships and participation on the use of digital music technologies. First, in study 2, participants with informal or formal music group memberships tended to use digital music technologies more often for sharing music and Active interacting with music. The link was even stronger than the association with social connectedness (see Table 4-8). Socialising & Contributing uses, such as commenting on music, rating music online, and communicating with e-mail showed no significant difference between members and non-members. Second, we found differences in the exploratory factors of informal and formal membership: informal music group participation was significantly correlated with social connectedness and music-technology self-efficacy; however, formal

music group participation was only associated with more advanced music expertise. The finding was identical to findings in study 1and 2, that formal music groups had a boundary in terms of music proficiency, even if such groups created "social spaces" (see Taylor et al., 2016) for its participants. Third, the association between social connectedness and whether participants were Spotify and YouTube users were only significant within music groups.

Whichever type of membership, the key point to highlight is that we have clear evidence that holding a group membership was associated with more frequent use of digital music technologies and the higher likelihood of identifying oneself as a user of related digital music technologies. As we noted before, this relationship can be grounded in the psychological significance of social identity. A self-categorisation approach (see section 2.3.1) helps to explain the various levels in which groups and social identities shape perception and action. At a perception level, social identification assists mutual intimacy among group members (Hopkins et al., 2016), provides attachment and meanings, and enables a sense of others as a source of recognition and support (Carroll & Rosson, 2013). Participants with a shared identity of music groups tend to engage in group activities continuously. The music education literature (i.e., Creech, Hallam, Varvarigou, et al., 2013) adopts this strand of thought and provides a conceptual model regarding mechanisms that underlie the relationship between community music participation and well-being in old age (Creech, Hallam, McQueen, & Varvarigou, 2013). At the level of action, the group that one belongs to impacts the "psychological field" of oneself and shapes the behaviour that is perceived to be meaningful for present and future participation (Hopkins et al., 2016). Carroll's conceptual model of community (as cited in Carroll & Rosson, 2013), as we noted in the introduction chapter, contextualises the action-level identification with community participation. Carroll argues that people tend to engage in "public visible activities" because of the awareness of shared meanings. As a consequence, informal help with technology emerged in the forms of new roles for the community (i.e., seniors as sources of wisdom in Carroll et al., 2012) and specialists with technological skills in Carroll & Rosson, 2013). In the case of our data, the practice of sharing music within groups was valuable for participation and created awareness in the group. We found that one's music group participation was a predictor of the degree to

which meaningful actions around technology use were conducted. Future research should consider different types of membership other than music and what are "meaningful" actions for which type of membership.

4.3.4.3 Self-efficacy: not a usability problem

Neither general computer (GC) self-efficacy nor music-technology-specific self-efficacy presented significant prediction effects on the use and sharing with digital music technologies. Music-technology self-efficacy is the measurement of participants' felt capability of completing tasks around digital music technologies. It means that the barrier or unwillingness of using digital music technologies is not due to usability issues, even if our participants considered that it was. In a broader sense, this finding is unsurprising, as research in other domains and age groups also pointed to the importance of culture and meanings of technology development over technology *per se* (e.g., Rosner, 2016).

In the data with the UK online sample, we only found that music-technology-specific self-efficacy was positively associated with the probability of belonging to informal music groups. This is a weaker link than social motivation (see Table 4-10). It implies two things: first, it is relevant to note that informal music groups usually focus on the social enjoyment of group music making. Music sharing by sending and receiving music files and links, as a typical practice in informal groups, implies being connected with the group and is sustained with digital music technologies. Drawing from social practice theory (Shove, 2007), the practical knowledge and know-how of digital music services accumulate over time and may contribute to a higher level of competence in doing so. Second, although our scale emphasises music-specific self-efficacy and makes sense in this research setting of particular practices around music participation, they are not all about features of popular online music services. This is likely to introduce measurement error. Future research might consider exploring the effect of feature-based self-efficacy on the adoption of a particular type of technology or product.

4.3.5 Summary

Digital music technologies were used and adopted in different ways by users with different motivations. We found that social motivation was among the most important factors in using digital music technologies and was strongly associated with self-reported use patterns and sharing behaviours. Music group participation contributed to more frequent use and a higher probability of using digital music technologies (e.g., YouTube and Spotify). This study adds to the digital music technology literature by providing an empirical case of situated technology use among middle-aged and older people and highlights the heterogeneity of this population. Our contextualisation of survey results and triangulation of previous qualitative results may prompt further discussion around the situated use and adoption of emerging technologies among the ageing population.

4.4 General Discussion

4.4.1 Age and technology use

How is age associated with the use of digital music technologies? Our findings show that age is a relevant factor but not a prominent one. In the Cambridge local sample, age was moderately correlated to the bundled use patterns, whilst music group membership was strongly correlated to uses. In the UK online sample, age was not significantly correlated with use and sharing frequencies. In both age groups of the UK online sample (those younger than 55 and those aged 55 and above), social and informational motivations were the most significant factors of using digital music technologies. In line with findings from Chapter 3 and social practice theory, the frequent use of technology reported by the participants was co-dependent upon their meaningful engagement in community music, such that the situated needs, motivations, and practices were sustained by the use of technology. The prominent role of social motivation in study 3 confirmed literature that examines the motivating factors of digital music technologies with younger samples (Krause et al., 2014). Our findings advance the understanding of social motivation in terms of age by providing evidence that

social connectedness is one of the primary motivating factors for younger and older adults. As such, our findings challenge the "myths of ageing" by showing that age was not the only factor that accounted for different use patterns of digital music technologies. Variations in motivations (see study 3) and music group memberships (see study 2 and 3) may affect use behaviours. Therefore, merely considering cohort effects is insufficient to unpack the motivations and uses of technology for the elderly, or for any age group.

Another common trend across study 2 and 3 is that use and sharing frequencies differed across age, though our participants mentioned that group music-making brought them happiness. This observation unsurprisingly confirms prior literature with respect to the age differences in music engagement and music preferences (e.g., Bonneville-Roussy et al., 2013), whilst music remains an essential part of life as people age (Rentfrow & Gosling, 2003). Then we ask, what underlies the age differences in the use of digital music technologies?

First, and most apparently, media preference accounts for the age differences in digital music technology usage. A wealth of literature has pointed to the effect of media preference of older adults in adopting and using new technologies (e.g., Cornejo, Tentori, & Favela, 2013; Dickinson & Hill, 2007; Gutierrez & Ochoa, 2016; Lindley, Harper, & Sellen, 2008). In particular, younger people often rely on social media for communication and media sharing (e.g., in-app media sharing, posting links on Facebook) (Karnik et al., 2013; Krause et al., 2014), whilst middle-aged and older adults prefer e-mail, face-to-face, and even letter writing to keep in touch with peers and share information. In the qualitative data (see section 3.2.3.1), our participants rely heavily on the conventional ways of music sharing (e.g., face-to-face sharing, e-mails, exchanging CDs) to maintain social connectedness with their music groups and even in non-community-music contexts. Given that the prior literature on media preference has been heavily focused on specific socio-cultural contexts (i.e., Gutierrez & Ochoa, 2016) and ICTs usage in general or in the context of family communication (i.e., Dickinson & Hill, 2007), this present work contributes an empirical case that confirms the existence of media preference across different age groups in the community music context.

Second, the life-span perspective and self-identity in different life stages provide a useful framework to explain age differences in technology use. Ericson (1968) proposes four primary life stages: adolescence (aged 12-19), young adulthood (aged 20-39), middle adulthood (aged 40-65), and older adulthood (aged 65 and above). People during adolescence are faced with the psychological challenge of forming a coherent identity (Harter, 2012); the music at this stage often serves as a "badge" of one's self-identity (Frith, 1981; North & Hargreaves, 2008). In other words, self-expression is vital for adolescents, who consume and use music to present their self-concepts and values. As individuals enter adulthood, establishing and maintaining friendship become important to them, and music is more often used to identify like-minded others and reinforce social roles (Ericsson, 1968). In contrast, middle-aged and older individuals tend to focus on building professional connections, staying together with family, and maintaining healthy and active lives (Carstensen, 1992). As a consequence, the needs of using music for self-expression diminish with age, whilst the gratifications for "relaxation and entertainment" become prominent (Bonneville-Roussy et al., 2013).

Likewise, our findings on the situated use of technology provide some support to this theory. For example, research suggests that younger people often value the self-expression motivation around the use of digital music technologies and tend to record videos that express themselves (Ferreira et al., 2017). However, in our qualitative findings, themes in relation to self-expression and self-status were seldom reported. Rather, the most common motivation for joining community music groups was for the enjoyment of music, and the more important motivation of using digital music technologies was to maintain social connectedness. Similarly, Orzech et al. (2017) found that older people tend to record videos that capture their daily experiences and memorable moments rather than videos for self-expression. These findings are indirectly linked to the age differences of using digital music technologies and provide likely explanations in terms of identity development. For some of our participants in the qualitative studies, they could hardly see the value of digital music technologies to their situated practices or considered the time investment in fixing technical issues or learning to use new tools as too high (see section 3.2.3.2). Therefore, they did not perceive these technologies as part of their community music practices (see section 3.2.4.2) and seldom had

enough motivation or competence to use these technologies. Most existing digital music technologies provide functionalities for music sharing and social interaction (e.g., Spotify's functionalities of sharing music with friends). However, the ways in which music are shared and social interactions are maintained with these existing platforms are not in line with our older participants' identities or practices (see Sayago et al., 2012).

4.4.2 Limitations

We are not suggesting that this work explains everything about the use, self-efficacy and motivations of digital music technologies among the middle-aged and senior citizens. First of all, both surveys measured self-reported perceived use frequency rather than behavioural data. Social desirability (see Phillips & Clancy, 1972) might have affected the participants' self-reports of their technology use frequencies. Future research may consider analysing log data of digital music systems, or behavioural data of e-mail communication for the purpose of music.

Second, in particular with study 3, the selection of online survey respondents may imply a sampling bias. We oversampled older participants who were active Internet users or were interested in completing tasks on online crowdsourcing platforms. It is possible that people who participated were more likely to use online services and ICTs. Given that the perceived confidence of using computers is associated with the actual use and perceived use of computers (Compeau et al., 1999), we measured and controlled for general computer self-efficacy. We hoped that this measurement would help mitigate the effects of sampling bias.

Third, in both surveys, the data was cross-sectional. Therefore, we were unable to make strong claims about the causality of the predictors, nor could we provide direct evidence about the temporal stability of the identified use patterns. Future work may consider using longitudinal methods to keep track of the use, motives and self-concepts with respect to digital music technologies and music participation. Also, in line with the interactionist perspective, shared identity, as the self-categorisation approach suggests, is shaped by the environment and interaction with others and may form a feedback loop (Hopkins et al., 2016) between identity and behaviour (i.e., technology use). Therefore, our findings on the

correlation between identity and technology use cannot imply whether there is a causal link between the two. This means that we need to be sensitive when concluding about shared identity and group participation, and we encourage future research into the consequences of group participation.

4.5 Chapter Summary

This chapter confirms many observations in the previous chapter with respect to the situated use of technology and partly elaborated on the *technology-competence* and *technology-meaning linkages*. The factor structure of digital music technology usage corresponded to music sharing and revisiting practices in Chapter 3. Different factor loadings across the two independent samples suggest that the use pattern should be generalised with caution. It further points to the observation that technology uses differed in terms of motivations, music-specific self-efficacy, music group memberships, and user identifications. The prominent role of group memberships in influencing uses and sharing patterns replicated across the two samples and extended the knowledge with respect to the accumulative nature of social participation. The strong effect of social motivation and the modest impact of music-technology-specific self-efficacy partially supported the propositions regarding the way in which community music practices develop. As such, this chapter on digital music technologies provides a partial view into a more general understandings of the relation between technology, people, the music groups that they belong to, and the activities.

A general observation is that the situated use of technology should be investigated alongside a field of individual-level and group-level expectations, motivations, and competences established by community music practices. Moreover, this present chapter highlights the heterogeneity of the late middle-aged and older population and illustrates a facet of active ageing and relevant components at play. It is through adopting a multidisciplinary perspective that we will develop a nuanced understanding of technology use and social participation.

Chapter 5 General Discussion and Conclusions

Scholars and commentators have long advocated the benefits of communal artistic activity for the ageing population. In this dissertation, we have investigated some of the ways in which technology (and digital music technologies, in particular) coordinates practices and configures people, competences, and meanings, and sustains meaningful participation. There are already well-established enquiries in gerontology, psychology, sociology, and HCI concerning the relations between people, technology, and active ageing. In the introductory and literature review chapters, we identified a set of gaps of knowledge left under-analysed. We sought to move into these gaps by attending to the subjective experiences of people and the subtleties of active participation and technology use. To begin with, we concentrated on four seemingly unrelated but co-dependent questions:

1. How do late middle-aged and older people participate in community music activities?
2. How is the situated use of technology by late middle-aged and older people associated with meaningful participation?
3. What is the factor structure of digital music technology use and how is it associated with demographics and self-efficacy?
4. How do motivations influence the use of digital music technologies, and how are motivations associated with age and group memberships?

In addressing these questions, we have travelled between interpretive and empirical-analytical paradigms in an attempt to capture and synthesise community music participation, use of technology, and the related psychological basis of components of community music practices. In this concluding chapter, we synthesise findings from previous chapters, draw out key conclusions and relate these to the identified gaps of knowledge. We then discuss the theoretical, methodological, and practical implications for active ageing and technology use, highlight the overall contribution of this dissertation, discuss limitations, and suggest future

directions. We wished to provide answers to "why and how technology might be adopted and used by older participants in their particular ways". Answers to this question have practical implications for community music and active ageing practitioners and, tacitly, for HCI researchers and designers to provide intellectual guidance to technology design in support of active ageing and social participation.

5.1 Connecting the Dots

We started the empirical enquiries by asking what motivated participants to join community music activities, and how and why they became committed members. Our participants were "recruited" to community music mainly through word-of-mouth; they reported two types of motivation: self-development and socialisation. Being a committed member was a provisionally stable status, as the perception of one's level of commitment may change due to the comparison between one's competences and the level of aspiration of the group, or one's vocal and physical conditions. People may temporarily or permanently leave their groups when they feel they are not as competent as others or perceive a mismatch of identities. In the first section of **study 1** (section 3.1) we further explored what people did in terms of meaningful participation in community music, and what *doing* meant for them. A general observation is that communal music participation was dependent on a range of music possessions (e.g., sheet music, CDs), technological devices (e.g., MP3s, personal computers), and the accomplishment of community music practices. The existence of different learning patterns in formal and informal music groups entailed a competence-related boundary: informal groups often had a relatively lower level of music aspiration and valued enjoyment and social support more; formal groups had a higher level of music aspiration and more advanced skills. In both types of groups, participants established and maintained identification and emotional connection with the groups. This observation led us to conclude that it was through participation and social interaction that participants' identities developed, competences accumulated, and the meanings of participation were established and reinforced. This prompted us to conceptualise meaningful participation. First, participation in community music was *cumulative*, such that the practical knowledge and confidence of *doing*

accumulated. As such, formal groups, which were usually perceived as more demanding, entailed more advanced skills and competence, in addition to time devoted to participation. Second, identity development occurred through participation: identity formulated from past experiences, current practices and expectations; identity was further enacted and reinforced through group actions; identity was constantly evaluated based on its attainability and desirability. Third, there was a dynamic relationship between *having* (music possessions and technological tools), *doing* (i.e., the accomplishment of community music practices), and *learning* (to use new technologies). Successfully adopted technological devices were not merely symbolic representations of self-concepts but were also configured into an existing network of already familiar possessions, tools, skills, and motivations. Taken together, these accounts indicate that the lens of social practice theory offers an insight on the complexities of community music practices. From this we highlight three general observations that are ageing-specific:

1. Community music participants experienced a circular "career" that encompassed being a new encounter, a committed member, and exiting a group or a type of activity.
2. Informal and formal music groups differed in their learning patterns, rituals, required skills and confidence. Usually, formal groups were more demanding in terms of music expertise.
3. Meaningful participation in community music entailed the *accumulation* of competences (i.e., skills and self-efficacy), the development of collective *identities*, and the distribution of music possessions and *technological devices*.

In section 3.1 we made a start by conceptualising meaningful participation in community music and detailing the relationships between people, technology, competences, and identities. The situated use of technology emerged as a cross-cutting theme here. However, the relatively general conclusions on technology use require further working through.

Motivated by a concern to unpack the role of technology in community music and a theoretical interest in elaborating the adoption path of technology in later life, in the second section of **study 1** (section 3.2), we dug more into the situated use of technology. We began by studying critical practices of community music in which technological devices were

embraced – music sharing and revisiting. We adopted the elemental approach of social practice theory (Shove et al., 2012). With respect to music sharing, technology coordinated a range of sharing-related practices-as-performances, such as sending and receiving digital music files, recording music. The differences in music learning patterns between informal and formal music groups partly accounted for the differences in perceiving and using shared music recordings: formal music group participants tended to regard shared recordings from their music instructors as less useful, compared to informal music group participants. Shared music recordings also conveyed an emotional connection and reminiscence meanings. Revisiting practices were prevalent among all participants, such that participants were able to grasp the subtleties of the music pieces by revisiting them (e.g., learning from different versions of music on streaming services). Moreover, in exceptional cases in relation to later life transitions (e.g., retirement, moving homes), revisiting practices were carried out to manage, retain, and discard what people *have*. Situational factors and future-facing identities influenced music revisiting practices. A general observation is that technology use and practices were interdependent; technology was involved in *coordinating* these practices. More interestingly, "new technologies" legitimated their use through the configuration among sharing and revisiting practices, identities, and accumulated competences. In other words, music sharing and revisiting practices developed and in the meantime, new technologies were adopted and reconfigured into an existing network of possessions, expectations, and aspirations. The *technology-competence* and *technology-meaning linkages* were reproduced and reconfigured (Shove et al., 2012) in this process. As a consequence, sharing and revisiting music digitally became more common as more participants were involved.

A lens of social practice theory provides a subtler way of making sense of what community music practices mean and what these practices require. In our data, the accumulated skills and confidence assisted people to exercise control over their later life by realising self-growth and relational goals. Technical skills were learnt, used, and also transferred (or redistributed) to domains other than community music, and consequently, participants achieved their self-growth goals and enjoyment through participation. Some participants reported an increase in the sense of control in maintaining social relationships through participation. Moreover, by

conceptualising community music participation as "social spaces", we observed that technological competences were also distributed between people, which further contributed to the sense of reciprocity. Our findings suggest that the accumulated and redistributed technical competences enhanced a sense of control and accomplishment, which were essential to psychological well-being and active ageing in the literature.

In the second section of **study 1**, we also extended the scope of music-related technologies to ICTs in general. Apart from connecting with music group members and instructors, participants used different ICTs in support of role transitions across different social circles on a daily basis. For instance, e-mail was the most prevalent communication tool for community music practices. Participants re-negotiated their roles across different circles in support of their faceted identities (Farnham & Churchill, 2011; Nippert-Eng, 1996). In the meantime, their technology use was shaped by the perceived closeness of relationships and communication contexts through the role transition across different social circles. We also observed cases in which technologies supported role transitions in a time of change (e.g., retirement, the loss of one's partner). Technology use, in these cases, assisted people to actualise their desired, future-facing selves. In the "social space" of community music, technology indirectly contributed to the facilitation of the mutual intimacy and the sense-making of the group culture and norms by supporting routine practices such as music sharing and revisiting. We arrive at the next four summary points that are ageing-specific:

1. Music sharing and revisiting practices encompassed a range of music possessions and technological devices; digital technology played a *coordinating* role in sustaining the development of sharing and revisiting practices.
2. The situated use of technology entailed a dynamic relationship among technological tools, music possessions, accumulated competences and future-facing identities of participants.
3. Competences accumulated through learning music and using technology and their redistribution helped with exercising control.

4. Technological devices *coordinated* a range of practices by enacting meanings of *doing* that include goal achievement, forward-facing identities, role transitions, and a sense of belonging to the "social spaces" of community music.

As the previous two points indicated, meaningful participation in community music implies identity development via routes such as exercising control, supporting role transitions and providing "social spaces". Also, the *technology-competence* and *technology-meaning linkages* were reproduced and reconfigured, meaning that the development of community music practices was not mutually exclusive with technology use (Dourish, 2006). Building on literature concerning the psychological significance of identity development, competence, and meanings, our findings point to the psychological importance of these elements that enable technology use and community music participation. As such, in studies 2 and 3, we particularly elucidated how self-efficacy (an exemplar of *competence*) and motivation (an exemplar of *meaning*) were associated with usage patterns and sharing frequencies of digital music technologies.

In **study 2**, using two independent samples, we specified two bundled use patterns of digital music technologies: Contributing (or Socialising & Contributing) and Active interacting. Although the factor structures and factor loadings differed slightly across the two independent samples, the meanings conveyed by use pattern were consistent in both samples. Contributing (or Socialising & Contributing) echoes the music sharing and learning practices among our community music participants (see section 3.2) and is concerned with sharing feelings and opinions about music with others. As for Active interacting, it echoes the broad concept of music revisiting (see section 3.2), and entails themes concerning acquiring, recording, managing, and learning music.

We further elaborated on the identified use patterns of digital music technologies by investigating the correlates between use patterns and individual differences (i.e., music group membership, age, employment status, and domain-specific self-efficacy). It is unsurprising that older and retired participants reported less frequent use and sharing than the younger, employed participants. However, the correlation effects with membership were stronger than that with age and employment status: for both samples, having formal or informal

membership was associated with more frequent Active interacting use and sharing with group members; such effects were prevalent among younger and older participants in both samples. Informal group members reported more frequent use and sharing with digital music technologies than formal group members. This observation lends support to our qualitative findings on the reconfiguration of the *technology-competence linkage*. Given that meaningful participation was cumulative, and music expertise required for meaningful participation accumulated and indicated the differences between more or less demanding learning patterns; community music practices developed as digital music technologies were learnt and used, and accordingly, technical skills were acquired and accumulated. More frequent in-group music sharing was reported by people who participated in community music groups. These observations suggest the importance of contexts, social environment, and meanings conveyed in *doing* – the accomplishment of practices. Our findings about music sharing and revisiting practices and the different music learning patterns between informal and formal music groups were validated at a modest level with the survey data.

Apart from the accumulation of practical knowledge concerning community music (e.g., music expertise, technical skills), the elaboration on the *technology-competence linkage* also involves the effect of domain-specific self-efficacy in the situated use of technology. In study 2, music-technology-specific self-efficacy was positively associated with Active interacting uses, sharing within groups and with family/friends. However, this theoretically important component displayed a weaker correlation effect than music group membership. Moreover, general computer-use self-efficacy only showed positive correlations with Active interacting uses across the two samples. These findings suggest that although computer literacy and self-efficacy of using technologies have been overtly emphasised in HCI literature, it may be that the barriers or unwillingness to use technology among the late middle-aged and older people in this study were not merely due to lack of confidence or actual usability issues. In contrast, the "broader culture of technology development" (Rosner, 2016), or as suggested by Suchman (2007), the contextual, individual, social, and technical factors in relation to practices altogether account for the use and perception of technology. To this end, our findings about the domain-specific self-efficacy spell out the fact that competences accumulated and were redistributed among actors (i.e., community music participants,

technologies), and it was through the reconfiguration of the *technology-competence linkage* that community music practices developed and persisted. These observations lead us to the following findings:

1. The survey data further lends support to the two bundled use patterns with respect to digital music technologies: Contributing (or Socialising & Contributing) and Active interacting with music.
2. The use of digital music technologies is not determined exclusively by age and employment status, but also by music group memberships and competences (e.g., music expertise, technical skills, and music-technology-specific self-efficacy).
3. Membership presented a stronger association effect with technology use in community music contexts, compared to individual differences and self-efficacy.

With these arguments in place, in **study 3**, we turned to elaborate on the *technology-meaning linkage* by investigating the impact of motivation on digital music technology use. Findings here were drawn from the UK online sample only. Specifically, we studied motivation as one exemplar of meanings using the Uses and Gratifications approach (Katz et al., 1973). An essential purpose of Active interacting with music, sharing music within music groups and with family/friends was to maintain social connectedness. Information seeking was not a strong motivation in the overall data. We further analysed if the *technology-competence (i.e., motivation) link*age differed between music group members and non-members. Social connectedness and information seeking were significantly associated with informal music group memberships; neither motivation predicted the likelihood of holding formal group memberships. This observation, coupled with the strong association between formal group memberships and music expertise, confirms our prior findings concerning the different learning patterns in informal and formal music groups. That is, participation in formal music groups was often more demanding than that in informal music groups; and participants with more advanced music skills had a higher likelihood of being formal group members. We then investigated the heterogeneity of music group members in terms of motivation, individual differences, and the possibility of identifying oneself as a user of digital music technologies (i.e., YouTube and Spotify). Again, social connectedness was a strong motivation of being a

YouTube & Spotify user and a Spotify user, whereas information seeking did not show any strong effect here.

With these observations altogether, we were able to elaborate on the *technology-meaning linkage* by demonstrating that getting social connectedness was a strong motivation for technology use, and the use and motives of digital music technologies (i.e., YouTube and Spotify) were dependent upon contextual factors (e.g., being a member of music groups). The *technology-meaning linkage* was constantly reconfigured such that the social motivation was strongly associated with technology use and user identification with specific services. To this end, we were able to embody the potential psychological significance of collective identity in the *technology-meaning linkage*, by contextualising survey findings in study 3 with the previous qualitative enquiries. The motivation of getting social connectedness reflected the perception of music group identification (e.g., a sense of belonging to the group, emotional connection with the group). Our qualitative findings show that music sharing practices within groups, for example, were perceived as meaningful in enhancing a sense of belonging and collective identities. Likewise, in study 3, our participants who had stronger social motivations reported more frequent music sharing practices. Collectively, the motivation of social connectedness linked participants' identities and their self-reported music sharing within community music groups. In other words, participation in community music contributed to the value of using digital music technologies. Digital music technologies were used and, in the meantime, it sustained the situated practices of community music.

A final theme with our quantitative findings is concerned with age. In the overall data, use and sharing frequencies differed between the ≥ 55 and < 55 groups, even though music remained a significant part of life in old age. However, when investigating the demographic and psychological correlates of technology use and sharing, the effect of age was not as strong as music group membership and the social motivation. Our qualitative and quantitative data suggests that age is a relevant factor in making sense of why and how technology is used by our participants in their particular ways. Finally, we add three further points of summary developed from study 3 (with the UK online sample only):

1. Getting social connectedness was a crucial motivation for more frequent use and sharing with digital music technologies, as well as a higher likelihood of identifying oneself as a user of digital music technologies.
2. Participating in music groups contributed to a higher likelihood of identifying oneself as a user of digital music technologies (i.e., YouTube and Spotify, Spotify) and more frequent usage: informal music group membership was associated with social connectedness motivation and music-technology-specific self-efficacy, whilst the formal group membership was only associated with a higher level of music expertise.
3. Age is relevant in thinking about why digital music technologies are used; however, it is not a prominent factor nor a barrier to technology use.

5.2 Implications for Active Ageing and Technology Use

This dissertation takes an inter-disciplinary perspective (Blackwell, 2015) by drawing insights from social psychology, gerontology, HCI, and sociology together. In the course of this dissertation, new connections were made between these seemingly unconnected disciplines. The findings may also be of practical relevance for active ageing practitioners, technology designers, and in more general, for the understanding of social participation in later life. In what follows, contributions and implications for active ageing and technology use of this dissertation will be discussed.

First, as mentioned in Chapter 1, this dissertation was partly inspired by the New Dynamics of Ageing (NDA) project[42]. Building on top of it, empirically, this dissertation contributes a productive context of technology use to the richly researched area of community music among older people. This dissertation details the ways in which the use and adoption of technology are linked to *competences* and *meanings* that constitute community music practices. This further adds to the empirical evidence with respect to participants' subjective experiences, attitudes, and meanings of community music participation in later life. For

[42] http://www.newdynamics.group.shef.ac.uk/

example, we identified two "new" community music practices – music sharing and revisiting – that were prompted and sustained by the incorporation of digital music technologies (see section 3.2.3.1). By analysing how these new practices develop and co-evolve with technology use, we drew implications about the establishment, development, and maintaining of social relationships in later life (see section 3.2.3.2). As Shove (2007) put it, "*technologies are implicated in the construction and reconstruction of social relations*" (p.148). Moreover, this dissertation contributes to the NDA project by elaborating on how collective identities and self-identity developed (see section 3.2.3.2). For example, researchers in the NDA project write about the importance of "musical possible selves" (Creech, Hallam, Varvarigou, Gaunt, et al., 2014) in enhancing active ageing through group music-making activities. This present work concerning the *technology-meaning linkage* alongside the social identity approach put it further by explaining how future-facing identities are formulated, enacted, and evaluated in the context of community music, and how motivations of using technologies in relation to future-facing identities correlate with uses (see section 3.2.3.2). The qualitative and quantitative data on the situated use of digital music technologies enrich the community music literature for the elderly and may prompt further inter-disciplinary research ideas.

Second, theoretically and analytically, our findings on how community music practices develop contribute to the active ageing literature. Results on the differences in music learning between informal and formal music groups led us to the observation that community music participation in old age was cumulative, such that the competences for participation (i.e., music expertise, technical skills, music-technology-specific self-efficacy) accumulated (see section 3.1.3.3). Moreover, our findings show that selective strategies in later life (e.g., Baltes & Baltes, 1990; Carstensen, 1995) were more likely to apply to those less demanding activities (see section 3.1.3.3). Progressing to more advanced music groups through active participation is possible however. In other words, the accumulation of competences through participation might enlarge the freedom of choice on the types of activities. However, the "career" of a community music participant was also determined and constrained by individual (e.g., health conditions, vocal conditions), social (e.g., the identity of being old), and perceptual (e.g., the knowledge of the appearance) factors (see section 3.1.3.1). In other

words, this dissertation confirms the existence of the cumulative ways of participation in community music.

Third, and again from the perspective of active ageing, this dissertation contributes a better understanding of how older people experience social and artistic participation and why they experience it in their particular ways. Active ageing (and successful ageing) researchers have been exploring how people spend and should spend their time on social participation. However, it is challenging to define what "active" or "successful" means to older people without attending to the "lay meanings" and subtleties of participation in later life. In response to the call for a subtler understanding of the subjective meanings of activity and active ageing (e.g., Clarke & Warren, 2007; Stenner et al., 2011), this work draws a nuanced picture of community music participation by elucidating how participation is experienced and by unpacking what people do for participation, why they do so, and what participation means to them and requires (see study 1 in section 3.1). Moreover, this dissertation elaborates on how digital music technologies are involved in coordinating community music practices. For example, the conceptualisation of meaningful participation (see section 3.1.3.3) provides an initial overview on the co-dependence between people, technologies, competences (i.e., technical and musical skills, self-efficacy), and meanings (i.e., identity development and motivations). Also, by uncovering music sharing and revisiting practices (see section 3.2.3.1), identity development through the accomplishment of such practices (see section 3.2.3.2), and how these practices were contingent on technological devices and music possessions (see section 3.2.3.2 and 3.2.4.1), we were able to demonstrate how people pursued active ageing through the enactment of *technology-competence* and *technology-meaning linkages*. Apart from the development of community music practices, we contend that community music participation enhances active ageing through a few "psychological pathways" (see Berkman et al., 2000): exercising control, supporting role transitions, and forming "social spaces" (see section 3.2.3.2). These pathways are embedded in the enactment of *technology-competence* and *technology-meaning linkages*. For example, our findings concerning the co-existence of the cognitive and relational route in identity development (see section 3.2.3.2) provide a nuanced view towards the social and psychological benefits of community music participation. In other words, this work contributes to the active ageing literature by detailing

the ways in which identities develop alongside the shifting relationships between people, technology, and contexts.

Fourth, this dissertation contributes to the HCI literature by providing a better understanding of how older people use technology for active ageing. Given the relatively limited literature with respect to the situated use of technology in the context of musical and artistic participation (see section 2.4.1), this dissertation provides a solid case of community music participation and technology use in later life. However, it is more than that. We illuminated the complexity of community music practices (see section 3.2.3.1), the social and cultural contexts in which these practices were accomplished (see section 3.2.3.2), how they interacted with people of different demographic backgrounds and psychological statuses (see study 3 in section 4.2), and how they co-evolved by incorporating and configuring new technologies (see section 3.2.4.1). More interestingly, we demonstrated the *coordinating* role of digital music technologies in sustaining the development of music sharing and revisiting practices (see section 3.2.3.1). These analytical observations of technology use, rooted in social practice theory and the situated action approach, prompted us to focus on the dynamic relations between *doing*, *having*, and *learning* (to use new technologies), and what it requires for *doing*. For example, the reasons for not adopting digital music technologies among our participants point to the observation that such technologies had not been effectively incorporated into people's existing practices or their network of artefacts, expectations, and aspirations (see section 3.3.1.2). As such, they tended to stick with conventional ways of sharing, such as e-mailing and face-to-face conversations (see section 3.2.3.1 and 3.2.4.2). It is not a usability issue, or not yet – at least based on our data with respect to the less evident effects of domain-specific self-efficacy (see section 4.2.4.2 and 4.3.4.3). This observation also echoes Ackerman's (2000) critiques about the heavily engineering-focused intuition, that people adopt and adapt to technologies that are well-designed, and that all human, social, and organisational issues of technology use are rooted in users themselves (Baxter & Sommerville, 2011). Instead, people appropriate technology and the environment to meet their needs (Ackerman, 2000). We agree on the premise noted in Ackerman (2000) that HCI researchers should not force users to adapt but should provide "intellectual guidance" with regard to how technology is used and situated in people's everyday lives. In sum, this

dissertation provides some initial "analytical contribution" (Dourish, 2006) to HCI by illuminating the complexities of community music practices, and points to the value of considering social and artistic participation as a site of understanding the interwoven configuration of people, technology, and context.

Fifth, this dissertation provides practical implications for active ageing practitioners and policymakers. Our findings contest the negative stereotypes of old age and have opened up new ways of thinking about technology use from the perspective of social practice theory. Given the social and psychological benefits of community music participation, how might practitioners promote the participation and support the engagement of older people in community music? In study 1 we wrote about the "careers" of individual community music participants. Echoing Wang et al.'s (2018) notion of the "Safety Net" in support of ageing-in-place, we noted that multiple social circles were of consequence in attracting and "recruiting" participants (see section 3.1.3.1). Therefore, to leverage social participation, active ageing practitioners (e.g., community music instructors, staff at U3As and aged care institutions) should not merely focus on hooking people up to social activities but also think about how social relationships might link to participants' competence, individual and collective identities, and motivations (see section 3.3.1). For example, we recommended practitioners to reframe community music activities as informal, open, and flexible opportunities (e.g., multiple short events, meetups, interactive performances as well as routine practices) so that participants would be comfortable in inviting their family and friends to their activities occasionally (see section 3.3.1.1). Extending our findings with respect to the cumulative nature of participation and competence, we recommended active ageing practitioners to support the visibility of progress and skills by identifying and recognising individuals with special contributions or highlighting the milestones in the context of activities. Demonstrating competences is not necessarily formal. Our purpose here is to bring these considerations into the mind of practitioners. Moreover, we suggested enabling competence sharing and technical support from different social circles, by embedding informal help into existing practices (see section 3.3.1.3). To embed informal technical help, practitioners might want to consider setting up inter-generational networks or redesigning current technology learning courses at U3As to be locally-relevant and enjoyable or facilitating "skill-swapping" in public

events by partnering with other local support institutions such as Age UK. In sum, we argue that our research provides a strong case that community music practices are contingent on technology use.

Lastly, our work allows us to describe the role that technology plays in community music practices and to make speculative considerations for *adoption* with respect to leveraging social participation and sustaining meaningful participation and active ageing. This dissertation does not intend to straightforwardly provide design guidance nor solutions (see Dourish, 2006). Instead, we respond to Lindley et al.'s (2017) call for "packaging speculations about the potential future adoption" by illuminating the complexities and situatedness of the use of digital music technologies in the context of community music. Building upon our findings, technology designers might consider "*designing the entire ecosystems of interacting artefacts*" (Shove, 2007, p. 135) by thinking about how technological devices, possessions, and practices co-evolve. For example, in terms of the development and re-distribution of competence in such an ecology, we suggested enabling peer support and the sharing of technological competences within and across social circles (see section 3.3.1.1 and 3.3.1.2) to support technology adoption and sustain community music practices. We also recommended demonstrating the accumulated skills and progress using curated digital contents (by practitioners or participants themselves) that could be shared, edited, and revisited by participants and their family and friends (see section 3.3.1.3), so as to link the evolution of competences to practices and collective identities. Moreover, the quantitatively prominent role of social motives (see study 3 in section 4.3) and the qualitatively significant role of music-technology-related efficacy beliefs (see section 3.2.3.2) in the use of digital music technologies, collectively, confirmed the fact that technology adoption is co-dependent upon the motivation of socialisation and music-technology-related self-efficacy. Echoing what we wrote in section 4.3.4.3, merely fixing usability problems is not enough, and practitioners and designers might want to think about how technical competences can be facilitated by incorporating other social circles or by transferring from other domains. These recommendations together embody Shove's (2007) recommendation on the design of the entire ecosystems of interactive technologies with regards to informal technical help and competence sharing.

In addition to incorporating various social circles for technical support, our data suggests ways in which technology could support the experiences of newcomers and the sharing of experiences and memories to maintain social connectedness (see section 3.3.1.3). For example, one of our implications was to spread the elders' enthusiasm and collective identity by distributing the curated digital content via a range of channels (e.g., Facebook, YouTube, SoundCloud). Extending the work of Churchill et al. (2003), findings in Chapter 3 point to the potential of the community repository with the digital content of community music in facilitating conversations and memory. Although such digital contents have been part of the music sharing and revisiting practices (e.g., recorded music performance, playlists and listening history in music streaming services), the uses that we have recommended have not yet been actualised by commercial systems. Many existing systems particularly for the elderly that have reminiscence functions may not be appropriate for healthy and active older people and may even potentially isolate them (see section 2.4.2). Also, to curate such digital contents from existing commercial systems is not realistic for practitioners, caregivers and family because of time constraints (see also Waycott, Davis, Veter, Morgans, Gruner, Ozanne, & Kulik, 2014). Therefore, what we contribute to this body of work is a contextualisation of how digital music technologies and digital content can be used to sustain elders' participation in community music.

5.3 Limitations and Future Work

Taking community music participation as an exemplar of social and artistic participation among older people, we are able to tell a nuanced story about community music and technology use. However, there are still limitations to our approach.

First of all, the retrospective and cross-sectional nature of qualitative data means that the nuanced picture we drew about community music and technology use is only a snapshot of old age (see Chapter 3). Our qualitative and quantitative data is sufficient to answer the why and how questions with regard to people's experiences of ageing, community music participation and technology use. However, it makes less sense to expect that the results are

due to ageing or ageing-related life changes, even if it is so in a few cases (see the section *supporting role transition in a time of change* in Chapter 3). Likewise, in drawing attention to the implications for community music participation and active ageing, we are not suggesting a causal relationship between community music participation and psychological well-being, nor a longitudinal change of identity development from the data (e.g., the development of participants' "career" of community music participation in Chapter 3). Thus, further longitudinal work on technology use, how technology use is situated in community music participation, and how it impacts psychological well-being is needed. Also, it is essential to take a "life course" perspective (see Vines et al., 2015) and consider the impact of past life trajectories of participants on their strategies of approaching life situations and using technological devices in later life.

Second, though partly supported by the survey data with two independent samples, conclusions drawn from this dissertation cannot be generalised to all types of social participation and cultures. As mentioned in Chapter 3, the qualitative data from community music participants in Cambridge may be able to illuminate the complexities of community music participation and technology use by providing a solid empirical case of artistic participation and a set of analytical findings on how technology-mediated practices develop. However, it would be interesting to extend this work by (i) examining other types of artistic and non-artistic social participation among older people; and (ii) exploring our findings in different technological and cultural settings. Aligning with Pearce et al.'s (2016) findings, this dissertation suggests that both music and the "social spaces" of music enhances a sense of community and collective identities. However, our data did not provide evidence on the comparative effects of music and "social spaces", respectively. It may be that the community setting plays a larger role, as a few researchers suggest (e.g., Pearce et al., 2017; Pearce et al., 2016). For another, the same type of social participation is likely to have a different meaning in different cultures. For example, in Sun et al.'s (2015) study with Chinese older hackers, the "distinctiveness" of ageing is emphasised more than the "inclusiveness" that is common in Western cultures. Sun et al. (2015) explained such "distinctiveness" in terms of the historical and political background of the older generation in China. Therefore, it is conceivable to draw upon the broader social, cultural and political ecology (e.g., how practices fit into the

historical and cultural background) when extending findings of this dissertation to other cultures and domains.

Third, as mentioned in Chapter 4, both the Cambridge local sample and the UK online sample were relatively more educated, and the UK online sample included even more technology-savvy participants. As such, the findings drawing from the quantitative survey data, though partly supporting the qualitative data, should be carefully interpreted and generalised. For example, in Chapter 4, music-technology-specific self-efficacy did not play a significant role in influencing the reported use and sharing frequencies. However, the efficacy beliefs on technology use had a qualitative impact on community music practices that were mediated and coordinated by technological devices (see Chapter 3). Also, our self-reported data on technology use in Chapter 4 has limited explanatory power. As such, future research could consider using behavioural data (e.g., use logs of music streaming services and music purchase websites, email usage logs) or online ethnographic data (e.g., discourse analysis with posts in online forums), because such data may provide a longitudinal representation of users' motivation, competences, and identity. Longer-term research that considers changes in contexts, people, and technology can provide further insights into people's situated use of technologies when participating in social activities.

5.4 Concluding Remarks

In conclusion, this dissertation draws a situated, nuanced picture of meaningful participation and the situated use of technology in later life, and highlights the dynamic configuration between what people do, their self-efficacy, identity development, and motivations. This dissertation opens up conversations with respect to supporting active ageing practically and theoretically via the lens of social practice theory and the "situated action" approach. It is my hope that, albeit modestly, this work will advance the understanding of active ageing and technology use now and in the future.

References

Abrams, D., & Hogg, M. A. (2006). *Social Identifications: A Social Psychology of Intergroup Relations and Group Processes*. Routledge.

Ackerman, M. S. (2000). The intellectual challenge of CSCW: the gap between social requirements and technical feasibility. *Human-Computer Interaction*, *15*(2), 179–203.

Adams, D. A., Nelson, R. R., & Todd, P. A. (1992). Perceived usefulness, ease of use, and usage of information technology: A replication. *MIS Quarterly*, 227–247.

Adams, K. B., Leibbrandt, S., & Moon, H. (2011). A critical review of the literature on social and leisure activity and wellbeing in later life. *Ageing & Society*, *31*(4), 683–712. https://doi.org/10.1017/S0144686X10001091

Ahmed, A., Benford, S., & Crabtree, A. (2012). Digging in the Crates: An Ethnographic Study of DJS' Work. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1805–1814). New York, NY, USA: ACM. https://doi.org/10.1145/2207676.2208314

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Ajzen, I. (2002). Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior. *Journal of Applied Social Psychology*, *32*(4), 665–683. https://doi.org/10.1111/j.1559-1816.2002.tb00236.x

Alm, N., Astell, A., Gowans, G., Dye, R., Ellis, M., Vaughan, P., & Riley, P. (2009). Engaging multimedia leisure for people with dementia. *Gerontechnology*, *8*(4), 236–246.

Andriessen, J. E. (2012). *Working with groupware: understanding and evaluating collaboration technology*. Springer Science & Business Media.

Ansdell, G., & Pavlicevic, M. (2004). *Community Music Therapy*. Jessica Kingsley Publishers.

Bailey, B. A., & Davidson, J. W. (2002). Adaptive Characteristics of Group Singing: Perceptions from Members of a Choir Forhomeless Men. *Musicae Scientiae*, *6*(2), 221–256. https://doi.org/10.1177/102986490200600206

Balestrini, M., Bird, J., Marshall, P., Zaro, A., & Rogers, Y. (2014). Understanding Sustained Community Engagement: A Case Study in Heritage Preservation in Rural Argentina. In *Proceedings of the 32Nd Annual ACM Conference on Human Factors in Computing Systems* (pp. 2675–2684). New York, NY, USA: ACM. https://doi.org/10.1145/2556288.2557323

References

Baltes, M. M., & Carstensen, L. L. (1996). The Process of Successful Ageing. *Ageing and Society*, *16*(04), 397–422. https://doi.org/10.1017/S0144686X00003603

Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. *Successful Aging: Perspectives from the Behavioral Sciences*, *1*(1), 1–34.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191.

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist*, *44*(9), 1175–1184. https://doi.org/10.1037/0003-066X.44.9.1175

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A., & Jourden, F. J. (1991). Self-regulatory mechanisms governing the impact of social comparison on complex decision making. *Journal of Personality and Social Psychology*, *60*(6), 941.

Bartleet, B.-L., & Higgins, L. (2018). *The Oxford Handbook of Community Music*. Oxford University Press. Retrieved from http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780190219505.001.0001/oxfordhb-9780190219505

Batt-Rawden, K., & Tellnes, G. (2011). How music may promote healthy behaviour. *Scandinavian Journal of Public Health*, *39*(2), 113–120. https://doi.org/10.1177/1403494810393555

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Baumeister, R. F., Tice, D. M., & Hutton, D. G. (1989). Self-presentational motivations and personality differences in self-esteem. *Journal of Personality*, *57*(3), 547–579.

Baxter, G., & Sommerville, I. (2011). Socio-technical systems: From design methods to systems engineering. *Interacting with Computers*, *23*(1), 4–17. https://doi.org/10.1016/j.intcom.2010.07.003

Belcher, J. D., & Haridakis, P. (2013). The Role of Background Characteristics, Music-Listening Motives, and Music Selection on Music Discussion. *Communication Quarterly*, *61*(4), 375–396. https://doi.org/10.1080/01463373.2013.776986

Benford, S., Tolmie, P., Ahmed, A. Y., Crabtree, A., & Rodden, T. (2012). Supporting Traditional Music-making: Designing for Situated Discretion. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (pp. 127–136). New York, NY, USA: ACM. https://doi.org/10.1145/2145204.2145227

Bentley, F., Metcalf, C., & Harboe, G. (2006). Personal vs. commercial content: the similarities between consumer use of photos and music. In *Proceedings of the SIGCHI conference on Human Factors in computing systems* (pp. 667–676). ACM. http://dl.acm.org/citation.cfm?id=1124871

References

Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine*, *51*(6), 843–857. https://doi.org/10.1016/S0277-9536(00)00065-4

Bernstein, M. S., Marcus, A., Karger, D. R., & Miller, R. C. (2010). Enhancing Directed Content Sharing on the Web. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 971–980). New York, NY, USA: ACM. https://doi.org/10.1145/1753326.1753470

Besmer, A., & Richter Lipford, H. (2010). Moving Beyond Untagging: Photo Privacy in a Tagged World. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1563–1572). New York, NY, USA: ACM. https://doi.org/10.1145/1753326.1753560

Blackwell, A. F. (2015). HCI as an Inter-Discipline. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems* (pp. 503–516). ACM. Retrieved from http://dl.acm.org/citation.cfm?id=2732505

Blumer, H. (1986). *Symbolic interactionism: Perspective and method*. University of California Press.

Bonneville-Roussy, A., Rentfrow, P. J., Xu, M. K., & Potter, J. (2013). Music through the ages: Trends in musical engagement and preferences from adolescence through middle adulthood. *Journal of Personality and Social Psychology*, *105*(4), 703–717. https://doi.org/10.1037/a0033770

Bonneville-Roussy, A., Stillwell, D., Kosinski, M., & Rust, J. (2017). Age trends in musical preferences in adulthood: 1. Conceptualization and empirical investigation. *Musicae Scientiae*, 1029864917691571. https://doi.org/10.1177/1029864917691571

Bowling, A. (1993). The Concepts of Successful and Positive Ageing. *Family Practice*, *10*(4), 449–453. https://doi.org/10.1093/fampra/10.4.449

Bowling, A. (2008). Enhancing later life: How older people perceive active ageing? *Aging & Mental Health*, *12*(3), 293–301. https://doi.org/10.1080/13607860802120979

Bowling, A., & Iliffe, S. (2006). Which model of successful ageing should be used? Baseline findings from a British longitudinal survey of ageing. *Age and Ageing*, *35*(6), 607–614. https://doi.org/10.1093/ageing/afl100

Brewer, R., Morris, M. R., & Piper, A. M. (2016). Why would anybody do this?: Understanding Older Adults' Motivations and Challenges in Crowd Work. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (pp. 2246–2257). ACM. http://dl.acm.org/citation.cfm?id=2858198

Brewer, R. N., & Piper, A. M. (2017). xPress: Rethinking Design for Aging and Accessibility through a Voice-based Online Blogging Community. *PACM on Human-Computer Interaction*, *1*(2). https://doi.org/10.1145/3134661

Brewer, R., & Piper, A. M. (2016). 'Tell It Like It Really Is': A Case of Online Content Creation and Sharing Among Older Adult Bloggers. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (pp. 5529–5542). New York, NY, USA: ACM. https://doi.org/10.1145/2858036.2858379

References

Brown, B., Sellen, A. J., & Geelhoed, E. (2001). Music Sharing as a Computer Supported Collaborative Application. In W. Prinz, M. Jarke, Y. Rogers, K. Schmidt, & V. Wulf (Eds.), *ECSCW 2001* (pp. 179–198). Springer Netherlands. http://link.springer.com/chapter/10.1007/0-306-48019-0_10

Buehler, E., Branham, S., Ali, A., Chang, J. J., Hofmann, M. K., Hurst, A., & Kane, S. K. (2015). Sharing is Caring: Assistive Technology Designs on Thingiverse. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 525–534). New York, NY, USA: ACM. https://doi.org/10.1145/2702123.2702525

Buffel, T., De Donder, L., Phillipson, C., Dury, S., De Witte, N., & Verté, D. (2014). Social participation among older adults living in medium-sized cities in Belgium: the role of neighbourhood perceptions. *Health Promotion International*, *29*(4), 655–668. https://doi.org/10.1093/heapro/dat009

Bukov, A., Maas, I., & Lampert, T. (2002). Social Participation in Very Old AgeCross-Sectional and Longitudinal Findings From BASE. *The Journals of Gerontology: Series B*, *57*(6), P510–P517. https://doi.org/10.1093/geronb/57.6.P510

Caldeira, C., Bietz, M., Vidauri, M., & Chen, Y. (2017). Senior Care for Aging in Place: Balancing Assistance and Independence. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (pp. 1605–1617). New York, NY, USA: ACM. https://doi.org/10.1145/2998181.2998206

Carroll, J. M., Convertino, G., Farooq, U., & Rosson, M. B. (2012). The firekeepers: aging considered as a resource. *Universal Access in the Information Society*, *11*(1), 7–15.

Carroll, J. M., & Rosson, M. B. (2013). Wild at Home: The Neighborhood As a Living Laboratory for HCI. *ACM Transactions on Computer-Human Interaction*, *20*(3), 16:1–16:28. https://doi.org/10.1145/2491500.2491504

Carstensen, L. (1992). Social and emotional patterns in adulthood: support for socioemotional selectivity theory. *Psychology and Aging*, *7*(3), 331.

Carstensen, L. L. (1995). Evidence for a life-span theory of socioemotional selectivity. *Current Directions in Psychological Science*, *4*(5), 151–156.

Cheek, C., & Piercy, K. W. (2004). Quilting as age identity expression in traditional women. *The International Journal of Aging and Human Development*, *59*(4), 321–337.

Chen, K., & Chan, A. H. (2011). A review of technology acceptance by older adults. *Gerontechnology*, *10*(1), 1–12.

Chin, J., & Fu, W.-T. (2012). Age differences in exploratory learning from a health information website. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 3031–3040). ACM.

Chou, M.-C., & Liu, C.-H. (2016). Mobile Instant Messengers and Middle-Aged and Elderly Adults in Taiwan: Uses and Gratifications. *International Journal of Human–Computer Interaction*, *32*(11), 835–846.

References

Churchill, E. F., Nelson, L., & Denoue, L. (2003). Multimedia Fliers: Information Sharing With Digital Community Bulletin Boards. In M. Huysman, E. Wenger, & V. Wulf (Eds.), *Communities and Technologies* (pp. 97–117). Springer Netherlands.

Clarke, A., & Warren, L. (2007). Hopes, fears and expectations about the future: what do older people's stories tell us about active ageing? *Ageing & Society*, *27*(4), 465–488.

Comber, R., Hoonhout, J., van Halteren, A., Moynihan, P., & Olivier, P. (2013). Food Practices As Situated Action: Exploring and Designing for Everyday Food Practices with Households. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2457–2466). New York, NY, USA: ACM. https://doi.org/10.1145/2470654.2481340

Compeau, D., Higgins, C. A., & Huff, S. (1999). Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study. *MIS Quarterly*, *23*(2), 145–158. https://doi.org/10.2307/249749

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 189–211.

Corbin, J. M., & Strauss, A. L. (2008). *Basics of qualitative research: techniques and procedures for developing grounded theory* (3rd ed.). Thousand Oaks, Calif., Los Angeles, California; London: Sage Publications, Inc, SAGE Publications.

Cornejo, R., Tentori, M., & Favela, J. (2013). Ambient Awareness to Strengthen the Family Social Network of Older Adults. *Computer Supported Cooperative Work (CSCW)*, *22*(2–3), 309–344. https://doi.org/10.1007/s10606-012-9166-2

Cornwell, B., Laumann, E. O., & Schumm, L. P. (2008). The social connectedness of older adults: A national profile. *American Sociological Review*, *73*(2), 185–203.

Coyle, D., Moore, J., Kristensson, P. O., Fletcher, P., & Blackwell, A. (2012). I did that! Measuring users' experience of agency in their own actions. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2025–2034). New York, NY, USA: ACM. https://doi.org/10.1145/2207676.2208350

Cramm, J. M., van Dijck, H. M., & Nieboer, A. P. (2013). The Importance of Neighborhood Social Cohesion and Social Capital for the Well Being of Older Adults in the Community. *The Gerontologist*, *53*(1), 142–152. https://doi.org/10.1093/geront/gns052

Creech, A., Hallam, S., McQueen, H., & Varvarigou, M. (2013). The power of music in the lives of older adults. *Research Studies in Music Education*, *35*(1), 87–102. https://doi.org/10.1177/1321103X13478862

Creech, A., Hallam, S., Varvarigou, M., & McQueen, H. (2014). *Active Ageing with Music: Supporting wellbeing in the Third and Fourth Ages*. London, UK: IOE Press. Retrieved from https://www.ucl-ioe-press.com/books/art-and-music/active-ageing-with-music/

Creech, A., Hallam, S., Varvarigou, M., Gaunt, H., McQueen, H., & Pincas, A. (2014). The role of musical possible selves in supporting subjective well-being in later life. *Music Education Research*, *16*(1), 32–49. https://doi.org/10.1080/14613808.2013.788143

References

Creech, A., Hallam, S., Varvarigou, M., McQueen, H., & Gaunt, H. (2013). Active music making: a route to enhanced subjective well-being among older people. *Perspectives in Public Health*, *133*(1), 36–43. https://doi.org/10.1177/1757913912466950

Creech, A., Varvarigou, M., Hallam, S., McQueen, H., & Gaunt, H. (2014). Scaffolding, organizational structure and interpersonal interaction in musical activities with older people. *Psychology of Music*, *42*(3), 430–447. https://doi.org/10.1177/0305735613478313

Crescioni, A. W., & Baumeister, R. F. (2013). The four needs for meaning, the value gap, and how (and whether) society can fill the void. In *The experience of meaning in life* (pp. 3–15). Springer.

Croom, A. M. (2015). Music practice and participation for psychological well-being: A review of how music influences positive emotion, engagement, relationships, meaning, and accomplishment. *Musicae Scientiae*, *19*(1), 44–64. https://doi.org/10.1177/1029864914561709

Csikszentmihalyi, M. (2013). *Flow: The psychology of happiness*. Random House.

Csikszentmihalyi, M., & Rochberg-Halton, E. (1981). *The meaning of things: Domestic symbols and the self*. Cambridge University Press.

Czaja, S. J., Charness, N., Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., & Sharit, J. (2006). Factors predicting the use of technology: Findings from the center for research and education on aging and technology enhancement (CREATE). *Psychology and Aging*, *21*(2), 333–352. https://doi.org/10.1037/0882-7974.21.2.333

Czerwinski, M., Horvitz, E., & Wilhite, S. (2004). A Diary Study of Task Switching and Interruptions. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 175–182). New York, NY, USA: ACM. https://doi.org/10.1145/985692.985715

Damodaran, L., Olphert, C. W., & Sandhu, J. (2014). Falling Off the Bandwagon? Exploring the Challenges to Sustained Digital Engagement by Older People. *Gerontology*, *60*(2), 163–173. https://doi.org/10.1159/000357431

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 319–340.

Day, A. T. (1991). *Remarkable survivors: Insights into successful aging among women*. The Urban Insitute.

de Muijnck, W. (2013). The meaning of lives and the meaning of things. *Journal of Happiness Studies*, *14*(4), 1291–1307.

DeNora, T. (2000). *Music in everyday life*. Cambridge University Press.

Dholakia, U. M., Bagozzi, R. P., & Pearo, L. K. (2004). A social influence model of consumer participation in network-and small-group-based virtual communities. *International Journal of Research in Marketing*, *21*(3), 241–263.

Dickinson, A., & Hill, R. L. (2007). Keeping in touch: Talking to older people about computers and communication. *Educational Gerontology*, *33*(8), 613–630.

References

Doebele, A. (2012). Technology and the Choral Art: Music in the Cloud for the Modern Choral Director. *The Choral Journal*, *53*(5), 91–95.

Dourish, P. (2003). The appropriation of interactive technologies: Some lessons from placeless documents. *Computer Supported Cooperative Work (CSCW)*, *12*(4), 465–490.

Dourish, P. (2006). Implications for design. In *Proceedings of the SIGCHI conference on Human Factors in computing systems* (pp. 541–550). ACM.

Drury, J., Cocking, C., Beale, J., Hanson, C., & Rapley, F. (2005). The phenomenology of empowerment in collective action. *British Journal of Social Psychology*, *44*(3), 309–328.

Drury, J., & Reicher, S. (2005). Explaining enduring empowerment: A comparative study of collective action and psychological outcomes. *European Journal of Social Psychology*, *35*(1), 35–58.

Drury, J., & Reicher, S. (2009). Collective psychological empowerment as a model of social change: Researching crowds and power. *Journal of Social Issues*, *65*(4), 707–725.

Dunbar, R. I. M., Teasdale, B., Thompson, J., Budelmann, F., Duncan, S., Boas, E. van E., & Maguire, L. (2016). Emotional arousal when watching drama increases pain threshold and social bonding. *Open Science*, *3*(9), 160288. https://doi.org/10.1098/rsos.160288

Durick, J., Robertson, T., Brereton, M., Vetere, F., & Nansen, B. (2013). Dispelling Ageing Myths in Technology Design. In *Proceedings of the 25th Australian Computer-Human Interaction Conference: Augmentation, Application, Innovation, Collaboration* (pp. 467–476). New York, NY, USA: ACM. https://doi.org/10.1145/2541016.2541040

Durlak, J. A. (2009). How to Select, Calculate, and Interpret Effect Sizes. *Journal of Pediatric Psychology*, *34*(9), 917–928. https://doi.org/10.1093/jpepsy/jsp004

Durrant, A., Kirk, D., Trujillo-Pisanty, D., Moncur, W., Orzech, K., Schofield, T., … Monk, A. (2017). Transitions in digital personhood: Online activity in early retirement. Presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Denver. https://doi.org/10.1145/3025453.3025913

Ekerdt, D. J. (1986). The busy ethic: Moral continuity between work and retirement. *The Gerontologist*, *26*(3), 239–244.

Erikson, E. H. (1968). *Identity: Youth and crisis*. WW Norton & Company.

Farnham, S. D., & Churchill, E. F. (2011). Faceted identity, faceted lives: social and technical issues with being yourself online. In *Proceedings of the ACM 2011 conference on Computer supported cooperative work* (pp. 359–368). ACM. http://dl.acm.org/citation.cfm?id=1958880

Farzan, R., Dabbish, L. A., Kraut, R. E., & Postmes, T. (2011). Increasing commitment to online communities by designing for social presence. In *Proceedings of the ACM 2011 conference on Computer supported cooperative work* (pp. 321–330). ACM. http://dl.acm.org/citation.cfm?id=1958874

References

Feld, S. L. (1981). The focused organization of social ties. *American Journal of Sociology*, *86*(5), 1015–1035.

Fernández-Ballesteros, R. (2008). *Active aging: The contribution of psychology*. Hogrefe Publishing.

Ferreira, S. M., Sayago, S., & Blat, J. (2017). Older people's production and appropriation of digital videos: an ethnographic study. *Behaviour & Information Technology*, *36*(6), 557–574. https://doi.org/10.1080/0144929X.2016.1265150

Flandorfer, P. (2012). Population ageing and socially assistive robots for elderly persons: the importance of sociodemographic factors for user acceptance. *International Journal of Population Research*, *2012*.

Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, *7*(3), 286.

Foote, N. N. (1951). Identification as the basis for a theory of motivation. *American Sociological Review*, *16*(1), 14–21.

Fortin, C., Neustaedter, C., & Hennessy, K. (2014). Posting for Community and Culture: Considerations for the Design of Interactive Digital Bulletin Boards. In *Proceedings of the 32Nd Annual ACM Conference on Human Factors in Computing Systems* (pp. 1425–1434). New York, NY, USA: ACM. https://doi.org/10.1145/2556288.2556970

Foster, L., & Walker, A. (2015). Active and Successful Aging: A European Policy Perspective. *The Gerontologist*, *55*(1), 83–90. https://doi.org/10.1093/geront/gnu028

Frazier, L. D., Gonzalez, G. K., Kafka, C. L., & Johnson, P. M. (2002). Psychosocial influences on possible selves: A comparison of three cohorts of older adults. *International Journal of Behavioral Development*, *26*(4), 308–317.

Friemel, T. N. (2016). The digital divide has grown old: Determinants of a digital divide among seniors. *New Media & Society*, *18*(2), 313–331.

Fries, J. F. (1990). Medical perspectives upon successful aging. In *Successful aging: Perspectives from the behavioral sciences*. New York: Cambridge University Press.

Frith, S. (1981). Sound effects: youth, leisure, and the politics of rock'n'roll. New York: Pantheon Books.

Gibson, D. M. (1987). Interaction and well-being in old age: Is it quantity or quality that counts? *The International Journal of Aging and Human Development*, *24*(1), 29–40.

Goffman, E. (1959). *The presentation of self in everyday life*. London: Harmondsworth.

Gollwitzer, P. M., & Wicklund, R. A. (1985). The pursuit of self-defining goals. In *Action control* (pp. 61–85). Springer.

Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*(6), 504–528. https://doi.org/10.1016/S0092-6566(03)00046-1

Grape, C., Sandgren, M., Hansson, L.-O., Ericson, M., & Theorell, T. (2002). Does singing promote well-being?: An empirical study of professional and amateur singers during a

singing lesson. *Integrative Physiological & Behavioral Science*, *38*(1), 65–74. https://doi.org/10.1007/BF02734261

Greasley, A., Lamont, A., & Sloboda, J. (2013). Exploring Musical Preferences: An In-Depth Qualitative Study of Adults' Liking for Music in Their Personal Collections. *Qualitative Research in Psychology*, *10*(4), 402–427. https://doi.org/10.1080/14780887.2011.647259

Guo, P. J. (2017). Older Adults Learning Computer Programming: Motivations, Frustrations, and Design Opportunities. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 7070–7083). New York, NY, USA: ACM. https://doi.org/10.1145/3025453.3025945

Gutierrez, F. J., & Ochoa, S. F. (2016). Mom, I Do Have a Family!: Attitudes, Agreements, and Expectations on the Interaction with Chilean Older Adults. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (pp. 1402–1411). New York, NY, USA: ACM. https://doi.org/10.1145/2818048.2820000

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (1998). *Multivariate data analysis* (Vol. 5). Prentice hall Upper Saddle River, NJ.

Hallam, S. (2010). The power of music: Its impact on the intellectual, social and personal development of children and young people. *International Journal of Music Education*, *28*(3), 269–289. https://doi.org/10.1177/0255761410370658

Hallam, S., Creech, A., Varvarigou, M., & McQueen, H. (2012a). Perceived benefits of active engagement with making music in community settings. *International Journal of Community Music*, *5*(2), 155–174. https://doi.org/10.1386/ijcm.5.2.155_1

Hallam, S., Creech, A., Varvarigou, M., & McQueen, H. (2012b). The characteristics of older people who engage in community music making, their reasons for participation and the barriers they face. *Journal of Adult and Continuing Education*, *18*(2), 21–43. https://doi.org/10.7227/JACE.18.2.3

Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in practice*. Routledge.

Hanson, V. L. (2009). Age and Web Access: The Next Generation. In *Proceedings of the 2009 International Cross-Disciplinary Conference on Web Accessibility (W4A)* (pp. 7–15). New York, NY, USA: ACM. https://doi.org/10.1145/1535654.1535658

Harrison, J., & Ryan, J. (2010). Musical taste and ageing. *Ageing and Society*, *30*(4), 649.

Harter, S. (2012). *The construction of the self: developmental and sociocultural foundations* (2nd ed.). New York, NY: Guilford Press.

Haslam, S. A., O'brien, A., Jetten, J., Vormedal, K., & Penna, S. (2005). Taking the strain: Social identity, social support, and the experience of stress. *British Journal of Social Psychology*, *44*(3), 355–370.

Hathaway, R. S. (1995). Assumptions Underlying Quantitative and Qualitative Research: Implications for Institutional Research. *Research in Higher Education*, *36*(5), 535–562.

References

Havighurst, R. J. (1963). Successful aging. *Processes of Aging: Social and Psychological Perspectives*, *1*, 299–320.

Hays, T. (2005). Well-being in later life through music. *Australasian Journal on Ageing*, *24*(1), 28–32.

Hays, T., & Minichiello, V. (2005). The meaning of music in the lives of older people: a qualitative study. *Psychology of Music*, *33*(4), 437–451.

Herzog, A. R., & Markus, H. R. (1999). The self-concept in life span and aging research. *Handbook of Theories of Aging*, 227–252.

Higgins, L. (2007). Acts of hospitality: the community in Community Music. *Music Education Research*, *9*(2), 281–292. https://doi.org/10.1080/14613800701384441

Higgins, L. (2012). *Community Music: In Theory and In Practice*. Oxford University Press.

Hoare, M., Benford, S., Jones, R., & Milic-Frayling, N. (2014). Coming in from the Margins: Amateur Musicians in the Online Age. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1295–1304). New York, NY, USA: ACM. https://doi.org/10.1145/2556288.2557298

Hogg, M. A., & Reid, S. A. (2006). Social identity, self-categorization, and the communication of group norms. *Communication Theory*, *16*(1), 7–30.

Holstein, M., & Minkler, M. (2007). Critical Gerontology: Reflections for the 21st Century. In *Critical perspectives on ageing societies*. Bristol, UK: Policy.

Hooyman, N. R., & Kiyak, H. A. (2008). *Social Gerontology: A Multidisciplinary Perspective*. Pearson Education.

Hope, A., Schwaba, T., & Piper, A. M. (2014). Understanding Digital and Material Social Communications for Older Adults. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 3903–3912). New York, NY, USA: ACM. https://doi.org/10.1145/2556288.2557133

Hopkins, N., & Reicher, S. (2016). The psychology of health and well-being in mass gatherings: A review and a research agenda. *Journal of Epidemiology and Global Health*, *6*(2), 49–57. https://doi.org/10.1016/j.jegh.2015.06.001

Hopkins, N., Reicher, S. D., Khan, S. S., Tewari, S., Srinivasan, N., & Stevenson, C. (2016). Explaining effervescence: Investigating the relationship between shared social identity and positive experience in crowds. *Cognition and Emotion*, *30*(1), 20–32. https://doi.org/10.1080/02699931.2015.1015969

Hornung, D., Müller, C., Shklovski, I., Jakobi, T., & Wulf, V. (2017). Navigating Relationships and Boundaries: Concerns Around ICT-uptake for Elderly People. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 7057–7069). New York, NY, USA: ACM. https://doi.org/10.1145/3025453.3025859

Hsu, M.-H., & Chiu, C.-M. (2004). Internet self-efficacy and electronic service acceptance. *Decision Support Systems*, *38*(3), 369–381. https://doi.org/10.1016/j.dss.2003.08.001

Hutchins, E. (1991). Organizing work by adaptation. *Organization Science*, *2*(1), 14–39.

References

Iacobucci, D., Posavac, S. S., Kardes, F. R., Schneider, M. J., & Popovich, D. L. (2015). Toward a more nuanced understanding of the statistical properties of a median split. *Journal of Consumer Psychology*, *25*(4), 652–665. https://doi.org/10.1016/j.jcps.2014.12.002

Ihle, A., Gouveia, É. R., Gouveia, B. R., Linden, B. W. A. van der, Sauter, J., Gabriel, R., … Kliegel, M. (2017). The Role of Leisure Activities in Mediating the Relationship between Physical Health and Well-Being: Differential Patterns in Old and Very Old Age. *Gerontology*, 63(6), 560-571. https://doi.org/10.1159/000477628

Jahoda, M. (1982). *Employment and unemployment: A social-psychological analysis* (Vol. 1). CUP Archive.

Janke, M. C., Nimrod, G., & Kleiber, D. A. (2008). Reduction in leisure activity and well-being during the transition to widowhood. *Journal of Women & Aging*, *20*(1–2), 83–98.

Joyce, K., & Loe, M. (2010). A sociological approach to ageing, technology and health. *Sociology of Health & Illness*, *32*(2), 171–180.

K. Lewin. (1935). *A dynamic theory of personality; selected papers.* New York: New York.

Kankainen, A., & Lehtinen, V. (2011). Creative personal projects of the elderly as active engagements with interactive media technology. In *Proceedings of the 8th ACM conference on Creativity and cognition* (pp. 175–184). ACM.

Karnik, M., Oakley, I., Venkatanathan, J., Spiliotopoulos, T., & Nisi, V. (2013). Uses & Gratifications of a Facebook Media Sharing Group. In *Proceedings of the 2013 Conference on Computer Supported Cooperative Work* (pp. 821–826). New York, NY, USA: ACM. https://doi.org/10.1145/2441776.2441868

Katz, E., Blumler, J. G., & Gurevitch, M. (1974). Utilization of mass communication by the individual. In *J. G. Blumler & E. Katz (Eds.) The Uses of mass communications: current perspectives on gratifications research*. Beverly Hills: Sage Publications.

Katz, Elihu, Blumler, J. G., & Gurevitch, M. (1973). Uses and Gratifications Research. *Public Opinion Quarterly*, *37*(4), 509–523. https://doi.org/10.1086/268109

Kaufmann, J. C. (1998). *Dirty linen: couples and their laundry*. London: Middlesex University Press.

Kelly, R., Gooch, D., Patil, B., & Watts, L. (2017). Demanding by Design: Supporting Effortful Communication Practices in Close Personal Relationships. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (pp. 70–83). New York, NY, USA: ACM. https://doi.org/10.1145/2998181.2998184

Khan, S. S., Hopkins, N., Reicher, S., Tewari, S., Srinivasan, N., & Stevenson, C. (2016). How Collective Participation Impacts Social Identity: A Longitudinal Study from India. *Political Psychology*, *37*(3), 309–325. https://doi.org/10.1111/pops.12260

King, L. A., & Hicks, J. A. (2007). Lost and found possible selves: Goals, development, and well-being. *New Directions for Adult and Continuing Education*, *2007*(114), 27–37.

References

Kirk, D. S., & Sellen, A. (2010). On human remains: Values and practice in the home archiving of cherished objects. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *17*(3), 10.

Kittur, A., Chi, E. H., & Suh, B. (2008). Crowdsourcing User Studies with Mechanical Turk. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 453–456). New York, NY, USA: ACM. https://doi.org/10.1145/1357054.1357127

Kline, P. (1979). *Psychometrics and psychology*. London: Academic Press.

Kobayashi, M., Arita, S., Itoko, T., Saito, S., & Takagi, H. (2015). Motivating Multi-Generational Crowd Workers in Social-Purpose Work. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (pp. 1813–1824). ACM. http://dl.acm.org/citation.cfm?id=2675255

Krause, A. E., & North, A. C. (2014). Music listening in everyday life: Devices, selection methods, and digital technology. *Psychology of Music*, 0305735614559065. https://doi.org/10.1177/0305735614559065

Krause, A. E., & North, A. C. (2016). Music listening in everyday life: Devices, selection methods, and digital technology. *Psychology of Music*, *44*(1), 129–147.

Krause, A. E., North, A. C., & Heritage, B. (2014). The uses and gratifications of using Facebook music listening applications. *Computers in Human Behavior*, *39*, 71–77. https://doi.org/10.1016/j.chb.2014.07.001

Krause, A. E., North, A. C., & Hewitt, L. Y. (2015). Music-listening in everyday life: Devices and choice. *Psychology of Music*, *43*(2), 155–170. https://doi.org/10.1177/0305735613496860

Kroger, J., & McLean, K. C. (2011). Identity Narratives during the Adult Years: Development and Learning. In *The Oxford Handbook of Reciprocal Adult Development and Learning (2 ed.)*. Oxford University Press.

Kruse, N. B., & Veblen, K. K. (2012). Music teaching and learning online: Considering YouTube instructional videos. *Journal of Music, Technology & Education*, *5*(1), 77–87.

Ku, Y.-C., Chu, T.-H., & Tseng, C.-H. (2013). Gratifications for using CMC technologies: A comparison among SNS, IM, and e-mail. *Computers in Human Behavior*, *29*(1), 226–234. https://doi.org/10.1016/j.chb.2012.08.009

Kwon, O., Choi, K., & Kim, M. (2007). User acceptance of context-aware services: self-efficacy, user innovativeness and perceived sensitivity on contextual pressure. *Behaviour & Information Technology*, *26*(6), 483–498. https://doi.org/10.1080/01449290600709111

Lang, C., & Barton, H. (2015). Just untag it: Exploring the management of undesirable Facebook photos. *Computers in Human Behavior*, *43*, 147–155. https://doi.org/10.1016/j.chb.2014.10.051

Laslett, P. (1991). *A fresh map of life: The emergence of the third age*. Harvard University Press.

References

Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press.

Lavretsky, H. (2014). *Resilience and aging: research and practice*. JHU Press.

Lazar, A., Diaz, M., Brewer, R., Kim, C., & Piper, A. M. (2017). Going Gray, Failure to Hire, and the Ick Factor: Analyzing How Older Bloggers Talk about Ageism. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (pp. 655–668). ACM. https://doi.org/10.1145/2998181.2998275

Lazar, A., Edasis, C., & Piper, A. M. (2017). A Critical Lens on Dementia and Design in HCI. In *CHI* (pp. 2175–2188).

Lazar, A., & Nguyen, D. H. (2017). Successful Leisure in Independent Living Communities: Understanding Older Adults' Motivations to Engage in Leisure Activities. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 7042–7056). ACM. https://doi.org/10.1145/3025453.3025802

Lee, C., & Coughlin, J. F. (2014). PERSPECTIVE: Older Adults' Adoption of Technology: An Integrated Approach to Identifying Determinants and Barriers. *Journal of Product Innovation Management*, 32(5), 747-759. https://doi.org/10.1111/jpim.12176

Lee, J. H., & Cunningham, S. J. (2013). Toward an understanding of the history and impact of user studies in music information retrieval. *Journal of Intelligent Information Systems*, *41*(3), 499–521. https://doi.org/10.1007/s10844-013-0259-2

Lee, J. H., & Waterman, N. M. (2012). Understanding User Requirements for Music Information Services. In *International Society for Music Information Retrieval* (pp. 253–258).

Lee, J. H., Wishkoski, R., Aase, L., Meas, P., & Hubbles, C. (2017). Understanding users of cloud music services: Selection factors, management and access behavior, and perceptions. *Journal of the Association for Information Science and Technology*, *68*(5), 1186–1200. https://doi.org/10.1002/asi.23754

Lee, Y. S., Chaysinh, S., Basapur, S., Metcalf, C. J., & Mandalia, H. (2012). Active Aging in Community Centers and ICT Design Implications. In *Proceedings of the Designing Interactive Systems Conference* (pp. 156–165). New York, NY, USA: ACM. https://doi.org/10.1145/2317956.2317981

Leong, T. W., & Wright, P. C. (2013). Revisiting Social Practices Surrounding Music. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 951–960). New York, NY, USA: ACM. https://doi.org/10.1145/2470654.2466122

Levine, M., Prosser, A., Evans, D., & Reicher, S. (2005). Identity and emergency intervention: How social group membership and inclusiveness of group boundaries shape helping behavior. *Personality and Social Psychology Bulletin*, *31*(4), 443–453.

Liddle, J. L. M., Parkinson, L., & Sibbritt, D. W. (2013). Purpose and pleasure in late life: Conceptualising older women's participation in art and craft activities. *Journal of Aging Studies*, *27*(4), 330–338. https://doi.org/10.1016/j.jaging.2013.08.002

References

Light, A., Howland, K., Hamilton, T., & Harley, D. A. (2017). The Meaning of Place in Supporting Sociality. In *Proceedings of the 2017 Conference on Designing Interactive Systems* (pp. 1141–1152). New York, NY, USA: ACM. https://doi.org/10.1145/3064663.3064728

Liikkanen, L. A., & Åman, P. (2015). Shuffling Services: Current Trends in Interacting With Digital Music. *Interacting with Computers*, *28*(3), 352–371.

Lindley, J., Coulton, P., & Sturdee, M. (2017). Implications for Adoption. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 265–277). New York, NY, USA: ACM. https://doi.org/10.1145/3025453.3025742

Lindley, S. E., Harper, R., & Sellen, A. (2009). Desiring to Be in Touch in a Changing Communications Landscape: Attitudes of Older Adults. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1693–1702). New York, NY, USA: ACM. https://doi.org/10.1145/1518701.1518962

Lindley, S. E., Marshall, C. C., Banks, R., Sellen, A., & Regan, T. (2013). Rethinking the web as a personal archive. In *Proceedings of the 22nd international conference on World Wide Web* (pp. 749–760). ACM. http://dl.acm.org/citation.cfm?id=2488454

Lindley, S., Harper, R., & Sellen, A. (2008). Designing for elders: exploring the complexity of relationships in later life. In *Proceedings of the 22nd Annual Conference of the British HCI Group (HCI 2008), Volume 1, 77-86.*

Lindley, S., & Wallace, J. (2015). Placing in Age: Transitioning to a New Home in Later Life. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *22*(4), 20:1–20:39. https://doi.org/10.1145/2755562

Lorenzo-Seva, U., & Ten Berge, J. M. (2006). Tucker's congruence coefficient as a meaningful index of factor similarity. *Methodology: European Journal of Research Methods for the Behavioral and Social Sciences*, *2*(2), 57.

Luborsky, M. R. (1994). The retirement process: Making the person and cultural meanings malleable. *Medical Anthropology Quarterly*, *8*(4), 411–429.

Magsamen-Conrad, K., Dowd, J., Abuljadail, M., Alsulaiman, S., & Shareefi, A. (2015). Life-Span Differences in the Uses and Gratifications of Tablets: Implications for Older Adults. *Computers in Human Behavior*, *52*, 96–106. https://doi.org/10.1016/j.chb.2015.05.024

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist*, *41*(9), 954.

Marwick, A. E., & Boyd, D. (2011). I tweet honestly, I tweet passionately: Twitter users, context collapse, and the imagined audience. *New Media & Society*, *13*(1), 114–133. https://doi.org/10.1177/1461444810365313

Massimi, M., Bender, J. L., Witteman, H. O., & Ahmed, O. H. (2014). Life Transitions and Online Health Communities: Reflecting on Adoption, Use, and Disengagement. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing* (pp. 1491–1501). New York, NY, USA: ACM. https://doi.org/10.1145/2531602.2531622

References

Massimi, M., Dimond, J. P., & Le Dantec, C. A. (2012). Finding a New Normal: The Role of Technology in Life Disruptions. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (pp. 719–728). New York, NY, USA: ACM. https://doi.org/10.1145/2145204.2145314

McKeown, S., Haji, R., & Ferguson, N. (2016). *Understanding Peace and Conflict Through Social Identity Theory: Contemporary Global Perspectives*. Springer.

McMillan, D. W., & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community Psychology*, *14*(1), 6–23.

McNeill, A. R., Coventry, L., Pywell, J., & Briggs, P. (2017). Privacy Considerations when Designing Social Network Systems to Support Successful Ageing. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 6425–6437). New York, NY, USA: ACM. https://doi.org/10.1145/3025453.3025861

Mead, G. H. (1934). *Mind, self and society* (Vol. 111). Chicago University of Chicago Press.

Melenhorst, A.-S., Rogers, W. A., & Bouwhuis, D. G. (2006). Older Adults' Motivated Choice for Technological Innovation: Evidence for Benefit-Driven Selectivity. *Psychology and Aging*, *21*(1), 190–195. https://doi.org/10.1037/0882-7974.21.1.190

Molapo, M., Densmore, M., & DeRenzi, B. (2017). Video Consumption Patterns for First Time Smartphone Users: Community Health Workers in Lesotho. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 6159–6170). New York, NY, USA: ACM. https://doi.org/10.1145/3025453.3025616

Moreland, R. L., & Levine, J. M. (1982). Socialization in small groups: Temporal changes in individual-group relations. *Advances in Experimental Social Psychology*, *15*, 137–192.

Morreale, F., Moro, G., Chamberlain, A., Benford, S., & McPherson, A. P. (2017). Building a Maker Community Around an Open Hardware Platform. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 6948–6959). New York, NY, USA: ACM. https://doi.org/10.1145/3025453.3026056

Morris, M., & Ogan, C. (1996). The Internet as Mass Medium. *Journal of Computer-Mediated Communication*, *1*(4). https://doi.org/10.1111/j.1083-6101.1996.tb00174.x

Morrissey, K., Garbett, A., Wright, P., Olivier, P., Jenkins, E. I., & Brittain, K. (2017). Care and Connect: Exploring Dementia-Friendliness Through an Online Community Commissioning Platform. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 2163–2174). New York, NY, USA: ACM. https://doi.org/10.1145/3025453.3025732

Morrissey, K., Wood, G., Green, D., Pantidi, N., & McCarthy, J. (2016). 'I'M a Rambler, I'M a Gambler, I'M a Long Way from Home': The Place of Props, Music, and Design in Dementia Care. In *Proceedings of the 2016 ACM Conference on Designing Interactive Systems* (pp. 1008–1020). New York, NY, USA: ACM. https://doi.org/10.1145/2901790.2901798

References

Morrow-Howell, N., & Gehlert, S. (2012). Social Engagement and a Healthy Aging Society. In *Public health for an aging society* (pp. 205–227). Baltimore, MD: Johns Hopkins University Press.

Müller, C., Hornung, D., Hamm, T., & Wulf, V. (2015). Practice-based design of a neighborhood portal: focusing on elderly tenants in a city quarter living lab. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 2295–2304). ACM. http://dl.acm.org/citation.cfm?id=2702449

Mun, Y. Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *International Journal of Human-Computer Studies*, *59*(4), 431–449.

Neves, B. B., Franz, R. L., Munteanu, C., Baecker, R., & Ngo, M. (2015). 'My Hand Doesn'T Listen to Me!': Adoption and Evaluation of a Communication Technology for the "Oldest Old". In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 1593–1602). New York, NY, USA: ACM. https://doi.org/10.1145/2702123.2702430

Neville, F., & Reicher, S. (2011). The experience of collective participation: Shared identity, relatedness and emotionality. *Contemporary Social Science*, *6*(3), 377–396.

Newman, D. B., Tay, L., & Diener, E. (2014). Leisure and Subjective Well-Being: A Model of Psychological Mechanisms as Mediating Factors. *Journal of Happiness Studies*, *15*(3), 555–578. https://doi.org/10.1007/s10902-013-9435-x

Nippert-Eng, C. (1996). Calendars and keys: The classification of "home" and "work". *Sociological Forum*, *11*(3), 563–582. https://doi.org/10.1007/BF02408393

North, A., & Hargreaves, D. (2008). *The social and applied psychology of music*. Oxford University Press.

O'Bryan, J. (2015). "We ARE our instrument!": Forming a singer identity. *Research Studies in Music Education*. https://doi.org/10.1177/1321103X15592831

Odom, W. (2014). *Critically Exploring the Virtual Possession Design Space Through Fieldwork and Constructive Design Research*. Carnegie Mellon University.

Odom, W., Banks, R., Kirk, D., Harper, R., Lindley, S., & Sellen, A. (2012). Technology Heirlooms?: Considerations for Passing Down and Inheriting Digital Materials. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 337–346). New York, NY, USA: ACM. https://doi.org/10.1145/2207676.2207723

O'Flynn, J. (2015). Strengthening choral community: The interaction of face-to-face and online activities amongst a college choir. *International Journal of Community Music*, *8*(1), 73–92.

O'Hara, K., & Brown, B. (2006). *Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies*. Springer.

Orlikowski, W. J. (1996). Improvising organizational transformation over time: A situated change perspective. *Information Systems Research*, *7*(1), 63–92.

References

Orzech, K. M., Moncur, W., Durrant, A., James, S., & Collomosse, J. (2017). Digital photographic practices as expressions of personhood and identity: variations across school leavers and recent retirees. *Visual Studies*, *32*(4), 313–328. https://doi.org/10.1080/1472586X.2017.1362959

Orzech, K. M., Moncur, W., Durrant, A., & Trujillo-Pisanty, D. (2018). Opportunities and challenges of the digital lifespan: views of service providers and citizens in the UK. *Information, Communication & Society*, *21*(1), 14–29. https://doi.org/10.1080/1369118X.2016.1257043

Ouwehand, C., de Ridder, D. T. D., & Bensing, J. M. (2007). A review of successful aging models: Proposing proactive coping as an important additional strategy. *Clinical Psychology Review*, *27*(8), 873–884. https://doi.org/10.1016/j.cpr.2006.11.003

Packer, J., & Ballantyne, J. (2011). The impact of music festival attendance on young people's psychological and social well-being. *Psychology of Music*, *39*(2), 164–181.

Palmgreen, P. (1984). Uses and gratifications: A theoretical perspective. *Annals of the International Communication Association*, *8*(1), 20–55.

Pantzar, M., & Sundell-Neiminen, R. (2003). Towards an ecology of goods: symbiosis and competition between household goods. In *Empathic design: User experience in product design* (Koskinen). Helsinki: IT Press.

Park, N., Kee, K. F., & Valenzuela, S. (2009). Being immersed in social networking environment: Facebook groups, uses and gratifications, and social outcomes. *Cyberpsychology and Behavior*, *12*(6), 729–733. https://doi.org/10.1089/cpb.2009.0003

Pearce, E., Launay, J., & Dunbar, R. I. M. (2015). The ice-breaker effect: singing mediates fast social bonding. *Royal Society Open Science*, *2*(10). https://doi.org/10.1098/rsos.150221

Pearce, E., Launay, J., MacCarron, P., & Dunbar, R. I. M. (2017). Tuning in to others: Exploring relational and collective bonding in singing and non-singing groups over time. *Psychology of Music*, *45*(4), 496–512. https://doi.org/10.1177/0305735616667543

Pearce, E., Launay, J., Machin, A., & Dunbar, R. I. M. (2016). Is Group Singing Special? Health, Well-Being and Social Bonds in Community-Based Adult Education Classes. *Journal of Community & Applied Social Psychology*, *26*(6), 518–533. https://doi.org/10.1002/casp.2278

Phang, C. W., Kankanhalli, A., & Sabherwal, R. (2009). Usability and sociability in online communities: A comparative study of knowledge seeking and contribution. *Journal of the Association of Information Systems*, *10*(10), 721–747.

Phillips, D. L., & Clancy, K. J. (1972). Some Effects of 'Social Desirability' in Survey Studies. *American Journal of Sociology*, *77*(5), 921–940. https://doi.org/10.1086/225231

Piper, A. M., Weibel, N., & Hollan, J. (2013). Audio-enhanced Paper Photos: Encouraging Social Interaction at Age 105. In *Proceedings of the 2013 Conference on Computer*

Supported Cooperative Work (pp. 215–224). New York, NY, USA: ACM. https://doi.org/10.1145/2441776.2441802

Piper, A. M., Weibel, N., & Hollan, J. D. (2014). Designing audio-enhanced paper photos for older adult emotional wellbeing in communication therapy. *International Journal of Human-Computer Studies*, *72*(8–9), 629–639. https://doi.org/10.1016/j.ijhcs.2014.01.002

Poortinga, W. (2006). Social relations or social capital? Individual and community health effects of bonding social capital. *Social Science & Medicine*, *63*(1), 255–270. https://doi.org/10.1016/j.socscimed.2005.11.039

Prensky, M. (2001). Digital Natives, Digital Immigrants Part 1. *On the Horizon*, *9*(5), 1–6. https://doi.org/10.1108/10748120110424816

Quadros, A. de. (2012). *The Cambridge Companion to Choral Music*. Cambridge University Press.

Reckwitz, A. (2002). Toward a theory of social practices: A development in culturalist theorizing. *European Journal of Social Theory*, *5*(2), 243–263.

Reicher, S. (2011). Mass action and mundane reality: An argument for putting crowd analysis at the centre of the social sciences. *Contemporary Social Science*, *6*(3), 433–449.

Reicher, S., & Haslam, S. A. (2006). Tyranny revisited. *Psychologist*, *19*(3), 146.

Reicher, S., & Hopkins, N. (2016). Perception, Action, and the Social Dynamics of the Variable Self. *Psychological Inquiry*, *27*(4), 341–347. https://doi.org/10.1080/1047840X.2016.1217584

Rentfrow, P. J. (2012). The Role of Music in Everyday Life: Current Directions in the Social Psychology of Music. *Social and Personality Psychology Compass*, *6*(5), 402–416. https://doi.org/10.1111/j.1751-9004.2012.00434.x

Rentfrow, P. J., & Gosling, S. D. (2003). The do re mi's of everyday life: the structure and personality correlates of music preferences. *Journal of Personality and Social Psychology*, *84*, 1236.

Rentfrow, P. J., & Gosling, S. D. (2006). Message in a ballad the role of music preferences in interpersonal perception. *Psychological Science*, *17*, 236–242.

Rice, M., Tan, W. P., Ong, J., Yau, L. J., Wan, M., & Ng, J. (2013). The Dynamics of Younger and Older Adult's Paired Behavior when Playing an Interactive Silhouette Game. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1081–1090). New York, NY, USA: ACM. https://doi.org/10.1145/2470654.2466138

Righi, V., Sayago, S., & Blat, J. (2017). When we talk about older people in HCI, who are we talking about? Towards a 'turn to community' in the design of technologies for a growing ageing population. *International Journal of Human-Computer Studies*. https://doi.org/10.1016/j.ijhcs.2017.06.005

References

Riley, P., Alm, N., & Newell, A. (2009). An interactive tool to promote musical creativity in people with dementia. *Computers in Human Behavior*, *25*(3), 599–608. https://doi.org/10.1016/j.chb.2008.08.014

Rip, A., & Kemp, R. (1998). Technological change. In *Human choice and climate change: an international assessment*. Columbus, OH: Battelle Press.

Rosenthal, R. (1991). *Meta-analytic procedures for social research* (Vol. 6). Sage.

Rosner, D. (2016). Conflicting Ideologies of the Digital Hand: Locating the Material in a Digital Age. In *Critical Craft: Technology, Globalization, and Capitalism* (pp. 189–198). Bloomsbury Publishing.

Rotman, D., & Preece, J. (2010). The 'WeTube' in YouTube–creating an online community through video sharing. *International Journal of Web Based Communities*, *6*(3), 317–333.

Rowe, J. W., & Kahn, R. L. (1997). Successful Aging. *The Gerontologist*, *37*(4), 433–440. https://doi.org/10.1093/geront/37.4.433

Rozanova, J. (2010). Discourse of successful aging in The Globe & Mail: Insights from critical gerontology. *Journal of Aging Studies*, *24*(4), 213–222.

Ruggiero, T. E. (2000). Uses and Gratifications Theory in the 21st Century. *Mass Communication and Society*, *3*(1), 3–37. https://doi.org/10.1207/S15327825MCS0301_02

Salovaara, A. (2012). Repurposive Appropriation and Creative Technology Use in Human–Computer Interaction. Helsinki Institute for Information Technology, Aalto University and University of Helsinki, Finland

Salovaara, A., Lehmuskallio, A., Hedman, L., Valkonen, P., & Näsänen, J. (2010). Information technologies and transitions in the lives of 55–65-year-olds: The case of colliding life interests. *International Journal of Human-Computer Studies*, *68*(11), 803–821. https://doi.org/10.1016/j.ijhcs.2010.06.007

Sayago, S., Forbes, P., & Blat, J. (2012). Older People's Social Sharing Practices in YouTube Through an Ethnographical Lens. In *Proceedings of the 26th Annual BCS Interaction Specialist Group Conference on People and Computers* (pp. 185–194). Swinton, UK, UK: British Computer Society. http://dl.acm.org/citation.cfm?id=2377916.2377937

Schatzki, T. R. (1996). *Social practices: A Wittgensteinian approach to human activity and the social*. Cambridge University Press.

Schouten, J. W. (1991). Selves in Transition: Symbolic Consumption in Personal Rites of Passage and Identity Reconstruction. *Journal of Consumer Research*, *17*(4), 412–425.

Schulkind, M. D., Hennis, L. K., & Rubin, D. C. (1999). Music, emotion, and autobiographical memory: They're playing your song. *Memory & Cognition*, *27*(6), 948–955. https://doi.org/10.3758/BF03201225

Sease, R., & McDonald, D. W. (2009). Musical Fingerprints: Collaboration Around Home Media Collections. In *Proceedings of the ACM 2009 International Conference on*

Supporting Group Work (pp. 331–340). New York, NY, USA: ACM. https://doi.org/10.1145/1531674.1531724

Seligman, M. E. (2012). *Flourish: A visionary new understanding of happiness and well-being*. Simon and Schuster.

Serrat, R., Villar, F., & Celdrán, M. (2015). Factors associated with Spanish older people's membership in political organizations: the role of active aging activities. *European Journal of Ageing*, *12*(3), 239–247. https://doi.org/10.1007/s10433-015-0341-4

Severin, W. J., & Tankard, J. W. (2001). *Communication theories: Origins, methods, and uses in the mass media*. Pearson College Division.

Shklovski, I., Burke, M., Kiesler, S., & Kraut, R. (2010). Technology adoption and use in the aftermath of Hurricane Katrina in New Orleans. *American Behavioral Scientist*, *53*(8), 1228–1246.

Shove, E. (2007). *The design of everyday life*. Berg.

Shove, E. (2010). Beyond the ABC: Climate Change Policy and Theories of Social Change. *Environment and Planning A: Economy and Space*, *42*(6), 1273–1285. https://doi.org/10.1068/a42282

Shove, E., Pantzar, M., & Watson, M. (2012). *The Dynamics of Social Practice: Everyday Life and how it Changes*. SAGE.

Silverstone, R. (2006). Domesticating Domestication. Reflecting on the Life of a Concept. In *Domestication of Media and Technology* (pp. 229–248). Maidenhead, UK: Open University Press.

Silverstone, R., & Haddon, L. (1996). Design and the domestication of ICTs: technical change and everyday life. *Communicating by Design: The Politics of Information and Communication Technologies*, 44–74.

Smith, A., Anderson, M., & Page, D. (2017). *Tech Adoption Climbs Among Older Adults*. Pew Research Center. Retrieved from http://www.pewinternet.org/2017/05/17/tech-adoption-climbs-among-older-adults/

Smith, J., & Freund, A. M. (2002). The dynamics of possible selves in old age. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*(6), 492–500.

Sokoler, T., & Svensson, M. S. (2007). Embracing ambiguity in the design of non-stigmatizing digital technology for social interaction among senior citizens. *Behaviour & Information Technology*, *26*(4), 297–307.

Stebbins, R. A. (2008). Right leisure: Serious, casual, or project-based? *NeuroRehabilitation*, *23*(4), 335–341.

Stein, M., Meurer, J., Boden, A., & Wulf, V. (2017). Mobility in Later Life: Appropriation of an Integrated Transportation Platform. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 5716–5729). New York, NY, USA: ACM. https://doi.org/10.1145/3025453.3025672

References

Stenner, P., McFarquhar, T., & Bowling, A. (2011). Older people and 'active ageing': Subjective aspects of ageing actively. *Journal of Health Psychology*, *16*(3), 467–477. https://doi.org/10.1177/1359105310384298

Stephens, C., Alpass, F., Towers, A., & Stevenson, B. (2011). The Effects of Types of Social Networks, Perceived Social Support, and Loneliness on the Health of Older People: Accounting for the Social Context. *Journal of Aging and Health*, *23*(6), 887–911. https://doi.org/10.1177/0898264311400189

Suchman, L. (2002). Practice-based Design of Information Systems: Notes from the Hyperdeveloped World. *The Information Society*, *18*(2), 139–144.

Suchman, L. (2007). *Human-machine Reconfigurations: Plans and Situated Actions*. Cambridge University Press.

Suchman, L. A. (1987). *Plans and situated actions: The problem of human-machine communication*. Cambridge university press.

Suchman, L., Blomberg, J., Orr, J. E., & Trigg, R. (1999). Reconstructing technologies as social practice. *American Behavioral Scientist*, *43*(3), 392–408.

Sugarhood, P., Eakin, P., & Summerfield-Mann, L. (2017). Participation in advanced age: enacting values, an adaptive process. *Ageing & Society*, *37*(8), 1654–1680. https://doi.org/10.1017/S0144686X16000568

Sun, Y., Ding, X., Lindtner, S., Lu, T., & Gu, N. (2014). Being Senior and ICT: A Study of Seniors Using ICT in China. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 3933–3942). New York, NY, USA: ACM. https://doi.org/10.1145/2556288.2557248

Sun, Y., Lindtner, S., Ding, X., Lu, T., & Gu, N. (2015). Reliving the Past & Making a Harmonious Society Today: A Study of Elderly Electronic Hackers in China. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (pp. 44–55). ACM.

Tajfel, H. (2010). *Social identity and intergroup relations*. Cambridge University Press.

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. *The Social Psychology of Intergroup Relations*, *33*(47), 74.

Tajfel, H., & Turner, J. C. (2004). The social identity theory of intergroup behavior.

Tarr, B., Launay, J., & Dunbar, R. I. M. (2014). Music and social bonding: 'self-other' merging and neurohormonal mechanisms. *Frontiers in Psychology*, *5*, 1096. https://doi.org/10.3389/fpsyg.2014.01096

Taylor, N., Clarke, L., & Gorkovenko, K. (2017). Community Inventor Days: Scaffolding Grassroots Innovation with Maker Events. In *Proceedings of the 2017 Conference on Designing Interactive Systems* (pp. 1201–1212). New York, NY, USA: ACM. https://doi.org/10.1145/3064663.3064723

Taylor, N., Hurley, U., & Connolly, P. (2016). Making Community: The Wider Role of Makerspaces in Public Life. In *Proceedings of the 2016 CHI Conference on Human*

Factors in Computing Systems (pp. 1415–1425). New York, NY, USA: ACM. https://doi.org/10.1145/2858036.2858073

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*(2), 144–176.

Thomas, L., Briggs, P., Hart, A., & Kerrigan, F. (2017). Understanding social media and identity work in young people transitioning to university. *Computers in Human Behavior*, *76*, 541–553. https://doi.org/10.1016/j.chb.2017.08.021

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987). *Rediscovering the social group: A self-categorization theory.* Basil Blackwell.

Turner, J. C., Oakes, P. J., Haslam, S. A., & McGarty, C. (1994). Self and collective: Cognition and social context. *Personality and Social Psychology Bulletin*, *20*(5), 454–463.

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*, *46*(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Vines, J. (2011). Ageing Futures: Towards Cognitively Inclusive Digital Media Products. Retrieved from https://pearl.plymouth.ac.uk/handle/10026.1/541

Vines, J., Blythe, M., Dunphy, P., Vlachokyriakos, V., Teece, I., Monk, A., & Olivier, P. (2012). Cheque Mates: Participatory Design of Digital Payments with Eighty Somethings. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1189–1198). New York, NY, USA: ACM. https://doi.org/10.1145/2207676.2208569

Vines, J., Dunphy, P., Blythe, M., Lindsay, S., Monk, A., & Olivier, P. (2012). The joy of cheques: trust, paper and eighty somethings. In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work* (pp. 147–156). ACM.

Vines, J., Lindsay, S., Pritchard, G. W., Lie, M., Greathead, D., Olivier, P., & Brittain, K. (2013). Making Family Care Work: Dependence, Privacy and Remote Home Monitoring Telecare Systems. In *Proceedings of the 2013 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (pp. 607–616). New York, NY, USA: ACM. https://doi.org/10.1145/2493432.2493469

Vines, J., Pritchard, G., Wright, P., Olivier, P., & Brittain, K. (2015). An Age-Old Problem: Examining the Discourses of Ageing in HCI and Strategies for Future Research. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *22*(1), 2.

Vitak, J., & Kim, J. (2014). You can't block people offline: examining how Facebook's affordances shape the disclosure process. In *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing* (pp. 461–474). ACM.

Voida, A., Erickson, T., Kellogg, W. A., & Mynatt, E. D. (2004). The meaning of instant messaging. In *Companion Proceedings of the ACM Conference on Computer-Supported Cooperative Work* (pp. 6–10).

Voida, A., Grinter, R. E., & Ducheneaut, N. (2006). Social practices around iTunes. In *Consuming music together* (pp. 57–83). Springer.

References

Wakeling, K., & Clark, J. (2015). Beyond health and well-being: transformation, memory and the virtual in older people's music and dance. *International Journal of Ageing and Later Life*, *9*(2), 7–34. https://doi.org/10.3384/ijal.1652-8670.15262

Walker, A. (2002). A strategy for active ageing. *International Social Security Review*, *55*(1), 121–139. https://doi.org/10.1111/1468-246X.00118

Wang, X., Knearem, T., Gui, F., Gupta, S., Zhu, H., Williams, M., & Carroll, J. (2018). The Safety Net of Aging in Place: Understanding How Older Adults Construct, Develop, and Maintain Their Social Circles. In *Proceedings of the 12th EAI International Conference on Pervasive Computing Technologies for Healthcare*.

Warner, G., Doble, S. E., & Hutchinson, S. L. (2012). Successful aging in transition: contemplating new realities. *World Leisure Journal*, *54*(3), 255–268. https://doi.org/10.1080/04419057.2012.702455

Waycott, J., Davis, H., Vetere, F., Morgans, A., Gruner, A., Ozanne, E., & Kulik, L. (2014). Captioned Photographs in Psychosocial Aged Care: Relationship Building and Boundary Work. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 4167–4176). New York, NY, USA: ACM. https://doi.org/10.1145/2556288.2557290

Wheeler, L., & Miyake, K. (1992). Social comparison in everyday life. *Journal of Personality and Social Psychology*, *62*(5), 760.

World Health Organisation. (2002). *Active Aging - A Policy Framework.* Retrieved from http://www.who.int/ageing/publications/active_ageing/en/

Yap, S.-F., & Kapitan, S. (2017). Consumption coping and life transitions: An integrative review. *Australasian Marketing Journal (AMJ)*, *25*(3), 194–205. https://doi.org/10.1016/j.ausmj.2017.04.003

Yuan, C. W., Hanrahan, B. V., Rosson, M. B., & Carroll, J. M. (2018). Coming of old age: understanding older adults' engagement and needs in coproduction activities for healthy ageing. *Behaviour & Information Technology*, *37*(3), 232–246. https://doi.org/10.1080/0144929X.2018.1432686

Zhao, X., & Lindley, S. E. (2014). Curation Through Use: Understanding the Personal Value of Social Media. In *Proceedings of the 32Nd Annual ACM Conference on Human Factors in Computing Systems* (pp. 2431–2440). New York, NY, USA: ACM. https://doi.org/10.1145/2556288.2557291

Zolkepli, I. A., & Kamarulzaman, Y. (2015). Social media adoption: The role of media needs and innovation characteristics. Computers in Human Behavior, 43, 189–209. https://doi.org/10.1016/j.chb.2014.10.050

Appendix A Pre-screen questionnaire used in Chapter 3

You are invited to participate in a study on music and technology usage conducted by the Department of Psychology, University of Cambridge. To help us decide your eligibility, please fill out the survey below. Your response will remain completely anonymous. If you are interested in taking part in the upcoming study, please leave your contact details at the end of the survey and we will get back to you soon. Please give an answer for every question.

Q1. What is your gender?

☐ Male ☐ Female

Q2. In which year when you were born? _____

Q3. Are you retired?

☐ Yes
☐ Semi
☐ No
☐ Not Applicable

Q4. Have you ever had a job (jobs) that is (are) related to music? Yes/No

If yes, please specify it (them)_____

Q5. Which, if any, are the following music activities that you are doing (or have been doing)? Tick all that apply.

☐ Listening to music by my own
☐ Going to concert/theatre/live performance
☐ Singing in choirs
☐ Playing instruments/conducting in an orchestra
☐ Playing a role in a band
☐ Participating in events in music-related clubs/societies
☐ Teaching music

☐ Having musical training
☐ Other (Specifically:_____)

Q6. What is (are) your favourite music genre (genres) (tick all that apply)?

☐ Classical (e.g., avant-garde classical)
☐ Jazz (e.g., traditional jazz, acid jazz, etc.)
☐ Folk music
☐ Rock
☐ Rock n Roll
☐ Rap
☐ R&B/soul
☐ Pop (e.g., Power pop, Euro pop, etc.)
☐ Metal
☐ Electronica
☐ Country (new country, mainstream country)
☐ Latin
☐ Adult contemporary
☐ Punk
☐ World Beat
☐ Other (Specifically:_____)

Q7. Please specify the name (names) of the <u>MUSICAL GROUPS</u> (e.g., choir, orchestra, societies, etc.) that you are participating in (or have being participating in) currently.

_____

Q8. What is (are) the major music genre (genres) that **<u>YOUR MUSICAL GROUPS</u>** do?

_____

Q9. In a typical day when you spend the day at home, how many hours do you usually spend on listening to music?

☐ Less than 1 hour
☐ 2-4 hours
☐ 5-7 hours
☐ More than 7 hours

Q10. How many hours do you usually spend on playing music in an average day (e.g., rehearsal, performance, daily practice)?

☐ Less than 1 hour
☐ 2-4 hours
☐ 5-7 hours
☐ More than 7 hours

Q11. How much money do you spend on going to concerts/theatres (e.g., tickets, transportation fee, dining outside, etc.) during the past six months?

☐ None
☐ Less than 10 GBP
☐ 10-50 GBP
☐ 50-100 GBP
☐ 100-200 GBP
☐ More than 200 GB

Q12. How much money do you spend on your musical groups (e.g., buying/hiring scores, membership fees, coaching fee, etc.) during the past six months?

☐ None
☐ Less than 10 GBP
☐ 10-50 GBP
☐ 50-100 GBP
☐ 100-200 GBP
☐ More than 200 GB

Q13. How much money do you spend on your purchase on buying musical recordings/ scores for your own?

☐ None
☐ Less than 10 GBP
☐ 10-50 GBP
☐5 0-100 GBP
☐ 100-200 GBP
☐ More than 200 GBP

Q14. Do you read music-related articles (e.g., magazines, articles, books, etc.)?

Yes/No

If so, please also indicate the average hours you spend on doing so a day.

☐ Less than 1 hour
☐ 2-4 hours
☐ 5-7 hours
☐ More than 7 hours

Q15. Do you play any instruments? Yes/No

If so, please specify the name(s) of instrument(s): _____

And indicate how many years of formal training that you have taken (in total if more than one instruments are involved):

☐ Less than 2 years
☐ 2-5 years
☐ 5-10 years
☐ More than 10 years

Q16. Do you sing in a solo part? Yes / No

If so, how many years of solo singing experience do you have?

☐ Less than 2 years
☐ 2-5 years
☐ 5-10 years
☐ More than 10 years

Q17. Do you find yourself sensitive in spotting mistakes in performance?

1	2	3	4	5	6	7
I rarely spot any mistakes						I can always spot mistakes

Q18. How many hours on average do you do daily music practice?

☐ Less than 1 hour
☐ 2-4 hours
☐ 5-7 hours
☐ More than 7 hours

Q19. From the following list please choose select <u>ALL</u> devices that you own and use for personal and group use.

☐ Desktop PC (Please specify the number of it: ____)
☐ Notebook PC (Please specify the number of it:_____)
☐ Tablet PC
☐ Digital TV
☐ MP3/iPod players, or other portable music players (Specifically:_____)
☐ Record Player
☐ Printer
☐ Scanner
☐ Digital or Web Camera
☐ Digital Video Camera
☐ CD/HDD/DVD
☐ Game Console
☐ Mobile telephone (Please specify if it is a smart phone: _____)
☐ External Hard Disk Drives or USB Flash Drives
☐ Home Cinema System
☐ In-car system
☐ MIDI devices/ Synthesizer

Q20. Please tell us if you <u>use</u> the following (tick all that apply).

☐ Telephone calls
☐ Email (with attachments)
☐ Internet
☐ Media Player
☐ Television
☐ Camera
☐ Video
☐ Using social network services (Specifically: _____)

Q21. Please tell us if you USE the following applications/services (tick all that apply).

☐ Dropbox
☐ Spotify
☐ SoundCloud
☐ BBC iPlayer

☐ Amazon MP3
☐ iTunes
☐ Sibelius

Q22. I feel loyal to the people in my musical communities.

1	2	3	4	5	6	7
Not at all						Extremely so

Q23. I really care about the fate of the musical communities.

1	2	3	4	5	6	7
Not at all						Extremely so

Q24. I feel like I belong in my musical communities.

1	2	3	4	5	6	7
Not at all						Extremely so

Q25. I know how to collect information and be informed about musical community issues.

1	2	3	4	5	6	7
Not at all						Extremely so

Q26. I know how to get in touch with members of my musical communities when I need to communicate with them.

1	2	3	4	5	6	7
Not at all						Extremely so

Q27. I (would like to) volunteer time to work without pay for (a civic or community organisation or a group providing social services; a group involved in education; a political organisation or candidates for office).

1	2	3	4	5	6	7
Not at all						Extremely so

Q28. I (would like to) play a leadership role in my musical community (such as manager, secretary, or other administrative positions).

1	2	3	4	5	6	7
Not at all						Extremely so

If you would like to participate in this study, please leave your email address or mobile phone number to us:

_____

Your preference on the method of contact:

Pre-screen questionnaire used in Chapter 3

☐ Email
☐ Phone
☐ Both

---END---Thank you for your participation.

Appendix B Diary book used in Chapter 3

B.1 Diary instructions

This diary study aims at exploring music moments involved in people's daily lives. Please follow the instructions and complete the dairy entry three times a day.

Notable music moment: Any moment that music is involved in a typical day

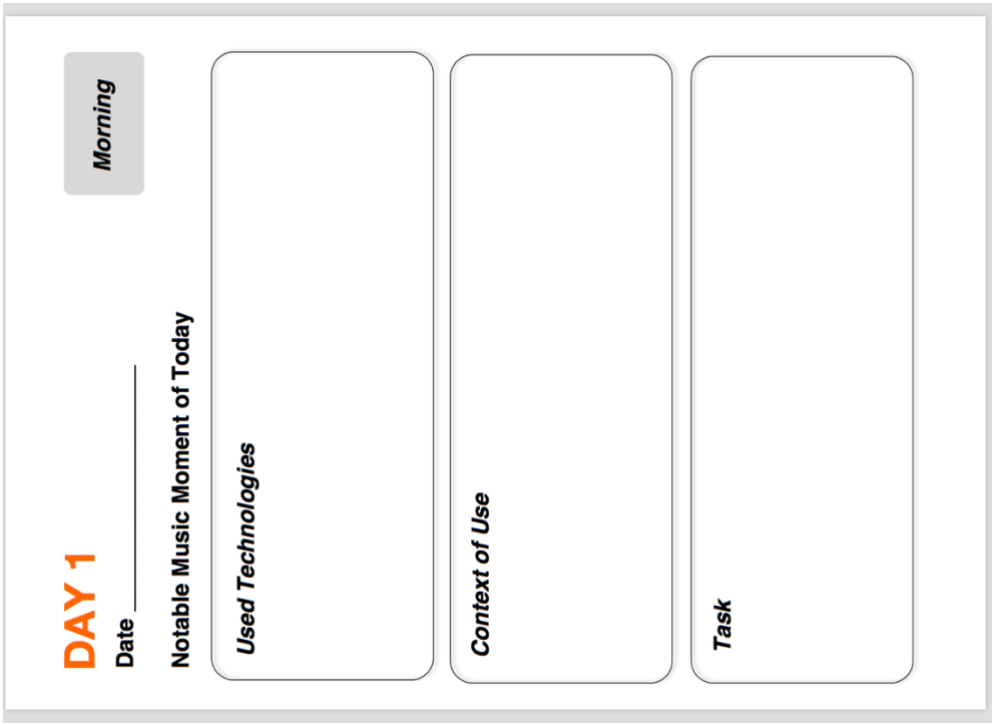
- Used Technologies: Any media, devices, or applications that you have used at the moment
- Context of Use: Anything related to environment that is involved at the moment, e.g., time, place, people involved etc.
- Task: Add any details of the moment that you would like to add, if any. E.g., a particular piece of music.

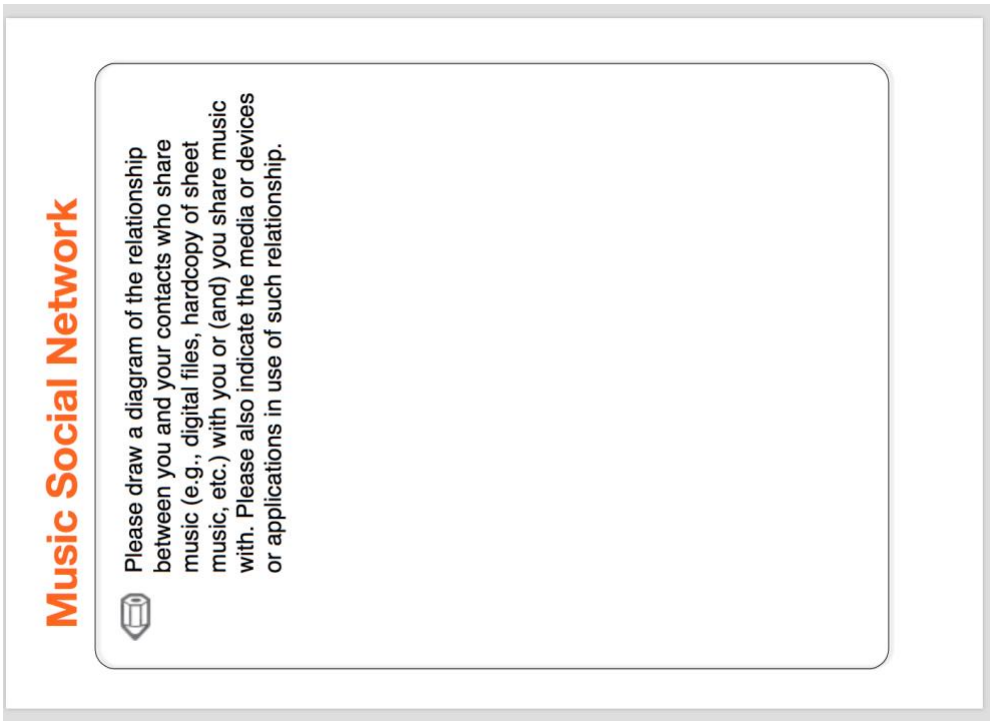
We will send you a reminder every two days – please choose the preferred method:

- Email
- SMS
- Both

Should you have any questions and enquiries, please do not hesitate to write to us: **communitymusic.diarystudy@gmail.com.**

B.2 Tasks in the diary book





Appendix C Interview script used in Chapter 3

Introduction of the project

Thank for your participation in our project. This project is to discover aspects of people's digital activities to inform the design of new musical services. You have already been asked to take part in a diary study in the past week. Now you will be invited to take part in an interview, which will last about 40-50 minutes. During the interview, you will be firstly asked several questions regarding the diary studies and then spend the rest of the time discussing musical practices. At the end, you will complete a post-interview questionnaire.

During the interview, please feel free to express your ideas. All opinions are welcome. There are no right or wrong answers, and you don't need to agree.

Initial Questions (SCENARIO #1 Media Consumption Experience)

How was it to perform the tasks in the diary study?

- What were the most difficult/challenging ones, why?
- The easiest ones?

Among the used technologies indicated in the diary study, is there any music-listening device that are newly bought in your home? You mentioned that [your device] was newly bought; does it relate to your current activities of music?

Among the used technologies in the diary study, you mentioned that your device was of relevance to finding out new music (if applicable), could you talk more about:

- Where do the new music come from?
- Any music introduced by your music groups/communities?
- (If purchasing is involved) Why do you buy the new music? Any important/specific reasons?
- (if purchasing is involved) Do you buy music with the consideration of what you already possess? What (type of) music would you consider in this way?

You mentioned that [the thing] indicated in Day X changed your life tremendously/a little; to what extent does it make you change?

Do you use digital products/services to listen to music? (if there are more than one, which do you use most?)

Interview script used in Chapter 3

[If the respondent uses digital devices to listen to music] What media or devices or applications do you use to listen to music on your computer/digital devices?

- Which media/devices/applications do you use most? (If Radio or TV, which channel do you listen to most?)

Potential services [Here are the screenshots of several existing digital musical services, which might be helpful in reminding you of what you have used or what similar experience you've ever had. You might have used or heard of some of them. We will have discussion based on two scenarios.]:

- Cloud services: Spotify, Amazon MP3, Apple iTunes
- Artist Profile sites: Bandcamp, Soundcloud
- Sharing tools: Dropbox, Facebook, Twitter
- Internet Radio: BBC iPlayer
- Music Blogs: The Hype Machine
- Event aggregators: (BandinTown, Songkick)

Your responses regarding your musical collection are interesting. What does collecting music mean to you? Do you have some strategies for arranging the collections?

(If the respondent had indicated personal/group musical practice in Day X) In what ways do these practice session affect you?

Potential digital music applications in use in this study - Categories referring to (Turnbull et al., 2014)[43]:

- Cloud services: Spotify, Amazon MP3, Apple iTunes
    - Here is the music streaming service that we will need to use during today's interview. You will find music database by clicking on "browse" on the left side of the interface. You may also use the search function on the left upper corner of the interface. The music streaming service can also in reality be run on a mobile phone, or a tablet.
- Artist Profile sites: Bandcamp, Soundcloud
- Soundcloud is the largest community of music and audio creators on the web. Creators on this platform can upload 12 hours of content, ranging from homemade demos to famous artists' trials. Users of Soundcloud can also repost their favourite songs to their own profiles, gathering comments and feedbacks from the community perspective, and sharing discovery. (Lead musicians and community music participants who had the experience of composing -----[END of Initial Questions]

[43] Turnbull, D. R., Zupnick, J. A., Stensland, K. B., Horwitz, A. R., Wolf, A. J., Spirgel, A. E., … Joachims, T. (2014). Using Personalized Radio to Enhance Local Music Discovery. In CHI '14 Extended Abstracts on Human Factors in Computing Systems (pp. 2023–2028). New York, NY, USA: ACM.

Interview script used in Chapter 3

Formal Interview

[Introduction to tell the respondents before showing the music services] For this part of the study, we will have you to talk about your musical practices within your musical groups. There will be two scenarios in total. In each scenario, you will be encouraged to browse one existing digital musical application as a start point for each task. You can browse each application freely. There is no time limit for any task, and no assessment won't be made on your performance. You may seek for help when coming across any barriers/confusions. Your spontaneous reactions, feedbacks, thoughts, and attitudes and comments would be very valuable for us.

If the respondents do not like the way of using these music services, ask them how they would like to do such things instead. Some actions the respondents might do intuitively without the instruction of the moderator.

SCENARIO #2 Media Sharing

[Describing the contextual information] What is the name of the pieces that your musical group is currently rehearsing?

Are there any musical pieces that like most? Please list 2 of them.

1. _____
2. _____

Task #1: Music sharing in one's musical group

Suppose that you are in charge of distributing/sharing [The name of the piece] to members in your musical group. I would like to see how you complete this task. (I would appreciate if you can think aloud during your interacting with it. Feel free to tell me what you are thinking, what you expecting, what you did and what was happening.)

Practice	Device	Context	Comments

Discussion

Spontaneous reactions? (Browsing music or trying to think of some melodies?) (what do they talk when choosing the music?)

How do you fine the current applications in assisting you to complete the task?

Any barriers in sharing music within your musical groups?

Task #2: Discovery of new music

Suppose that you are in charge of discovering new music for your musical group to perform/or play in next season. I would like to see how you complete this task. (I would appreciate if you can think aloud during your interacting with it. Please tell me what you are thinking, what you expecting, what you did and what was happening.)

Practice	Device	Context (with Whom)	Comments

Discussion

Spontaneous reactions?

Did you the music remind you of any specific stories/events/people/objects?

Task #3: Music revisiting

Suppose that you need to come back to the musical pieces that you've performed before, say [one of the two pieces that the respondent likes most]. What would you do to complete this task?

Practice	Device	Context (with Whom)	Comments

Discussion

Spontaneous reactions?

Do respondents return to previously played music? At what rate?

To what degree are current history-relevant facilities used?

Are there particular patterns in how music pieces are revisited?

Can the history mechanisms (or other relevant mechanisms) be designed to accommodate different patterns of revisit, and thereby make it easier to navigate back to music of interest?

Task #4: Following artists he likes for their updates

- Please search for an artist that you like.
- Follow him/her.

Discussion

Spontaneous reactions?

Interview script used in Chapter 3

Did some past events/stories/experience came into your mind when you browsing or selecting music?
What specific things came into your mind when sharing the music to your friend?

SCENARIO #3 Communication & Event Aggregation
[Describing the contextual information] Do you get in touch with people in your musical groups other than regular rehearsals/ performances (e.g., self-practice, hosting events, collaboration)? If so, could you tell me something about your musical practices like this?

[The participants are encouraged to lead the discussion as far as possible, and "to support their answers by presenting and demonstrating their websites, tools and use of file storage" (Hoare et al., 2014)]

Task #1: (If local practices have not been mentioned during the discussion) Local musical practices
Do you practice other than regular rehearsals?
Do you host/participate in social events?
Do you host/participate in other collaborative events?

Practice	Device/Applications/Functions	Context (with Whom)	Comments

Discussion

Would you expect these existing tools to be useful in pursuit your goals of local/remote musical activities?
Would you use these tools in promoting your group/community?
Do you find it easy to use? If yes, what functionalities/features that you like? If no, what difficulties have you ever encountered (or expected)?

Task #2: (If online collaboration/remixing is not mentioned) Do you have ever have such experience of gaining connections remotely or thinking of improving / expanding current work remotely?

(e.g., Inviting other musicians/ friends in another place, getting feedback from audiences, networking, promoting; Is there any other circumstances in which you would seek digital technologies to pursue your goal?)

Practice	Device	Context (with Whom)	Comments

Discussion

Would you expect these existing tools to be useful in pursuit your goals of local/remote musical activities?
Would you use these tools in promoting your group/community?
Do you find it easy to use? If yes, what functionalities/features that you like? If no, what difficulties have you ever encountered (or expected)?
Name the most difficult problems you encountered during former tasks and how you solve them?

----[END of Interactive section]

--END--

Appendix D Survey questionnaire used in Chapter 4

D.1 Pre-screen questions used in this survey

Q1 What is your age?

* Age 50+, qualified

Q2 Are you a member of any of the following? Select all that apply.

- □ Singing group (please specify how many) _____
- □ Orchestra (please specify how many) _____
- □ Other music performance group (please specify) _____
- □ None of above

* Any option except [None of above] selected, qualified. If [None of above] is selected, refer to the results of Q3.

Q3 Which, if any, are the following music activities that you are doing (or have been doing)? Tick all that apply.

- □ Participating in music-related events (e.g., clubs, societies, music festivals)
- □ Having musical training courses
- □ Teaching music
- □ Playing instruments
- □ Other, please describe _____
- □ None of above

* If any option except [None of above] is selected, qualified. If [None of above] is selected, not qualified for this study

D.2 A survey on digital technology in music

Note: I only show the questions analysed in this thesis. Questions that are the same in UK online survey and Cambridge local survey are labelled with 'Q'. Questions that are different in the two surveys are marked using "UK" or "CAM" respectively.

You are being invited to take part in a survey on digital technology in music. Its purpose is to explore people's use and perception of digital music technologies, and to inform the design of new technologies. This survey will take you around 15 min.

This study has received approval from the Psychology Research Ethics Committee of University of Cambridge. All data will be anonymised, and results of any analysis will be presented in a way of preserving anonymity. You are entirely free to withdraw from the study at any time. Non-participation would not affect your further healthcare in any way.

UK1 Are you a member of any of the following? Select all that apply.

- ☐ Singing group (please specify how many) _____
- ☐ Orchestra (please specify how many) _____
- ☐ Other music performance group (please specify) _____
- ☐ None of above

UK2 Do you participate any of the following? Select all that apply.

- ☐ Music classes (at community centre or University of The Third Age)
- ☐ Courses other than music (at community centre or University of The Third Age)
- ☐ Music workshops
- ☐ Informal music groups (please specify) _____
- ☐ None of above

UK3 Do you ever use the following online music streaming services?

	Yes	No
Amazon Prime Music	☐	☐
Last.FM	☐	☐
Napster	☐	☐
SoundCloud	☐	☐
Spotify	☐	☐
YouTube	☐	☐

UK4 If you use other services, please specify.

_____

CAM3 Do you ever use the Internet to _____?

	Yes	No
Access YouTube	☐	☐
Access SoundCloud	☐	☐
Access Spotify	☐	☐
Access Last.FM	☐	☐
Access Facebook	☐	☐

CAM4 Have you purchased any monthly/yearly plan on Spotify?

- ☐ Yes
- ☐ No
- ☐ Used to have
- ☐ Plan to buy

UK5 Do you ever use the following?

	Yes	No
Access Facebook	☐	☐
Access Twitter	☐	☐

Q6 How often do you do the following?

	Daily	Few Times a Week	Few Times a Month	Few Times a Year	Almost Never	Never
Search for music online	☐	☐	☐	☐	☐	☐
Rate music online	☐	☐	☐	☐	☐	☐
Bookmark music online	☐	☐	☐	☐	☐	☐
Recommend music to someone	☐	☐	☐	☐	☐	☐
Post a comment about music	☐	☐	☐	☐	☐	☐

CAM6 How often do you do the following?

	Daily	Few Times a Week	Few Times a Month	Few Times a Year	Almost Never	Never
Search for music online	☐	☐	☐	☐	☐	☐
Create playlists on Spotify	☐	☐	☐	☐	☐	☐
Listen to music on Spotify	☐	☐	☐	☐	☐	☐
Search for music-relevant videos on YouTube	☐	☐	☐	☐	☐	☐

Rate a music-relevant video on YouTube	☐	☐	☐	☐	☐	☐
Favourite/Bookmark a music-relevant video on YouTube	☐	☐	☐	☐	☐	☐
Recommend a piece of music (or music video) to someone	☐	☐	☐	☐	☐	☐
Embed/blog about a piece of music (or music video)	☐	☐	☐	☐	☐	☐
Post a comment about music (or music video)	☐	☐	☐	☐	☐	☐
Send music (or music video) to someone	☐	☐	☐	☐	☐	☐
Upload music on SoundCloud	☐	☐	☐	☐	☐	☐
Listen to music on digital music players with the computer	☐	☐	☐	☐	☐	☐
Listen to music on music applications with handheld device (e.g., iPad, smartphones)	☐	☐	☐	☐	☐	☐
Listen to music on portable devices (e.g., MP3, iPod)	☐	☐	☐	☐	☐	☐
Record music on computer software or mobile music applications	☐	☐	☐	☐	☐	☐
Edit and (or) produce music files on computer software	☐	☐	☐	☐	☐	☐
Listen to music on CD/Vinyl/Cassettes	☐	☐	☐	☐	☐	☐
Use in-car music system	☐	☐	☐	☐	☐	☐
Buy digital music (tracks or albums) from online stores (e.g., iTunes, Amazon, etc.)	☐	☐	☐	☐	☐	☐
Buy music-related devices	☐	☐	☐	☐	☐	☐
Learn music online	☐	☐	☐	☐	☐	☐
Email with music groups	☐	☐	☐	☐	☐	☐

UK7 How often do you do the following?

	Daily	Few Times a Week	Few Times a Month	Few Times a Year	Almost Never	Never
Upload music to SoundCloud	☐	☐	☐	☐	☐	☐
Record music	☐	☐	☐	☐	☐	☐
Buy music-related devices	☐	☐	☐	☐	☐	☐
Learn music online	☐	☐	☐	☐	☐	☐
Email with music groups	☐	☐	☐	☐	☐	☐

UK8 Do you have any music qualification or degree?

- No
- Yes (please specify) _____

UK9 Please indicate how many years of formal singing training that you have received

- Less than 2 years
- 2-5 years
- 5-10 years
- More than 10 years
- None

UK10 Please indicate how many years of formal instrument training that you have received

- Less than 2 years
- 2-5 years
- 5-10 years
- More than 10 years
- None

UK11 Why did you take part in music groups, courses, or workshops? Please rank the following items by dragging them up or down.

_____ For enjoyment of the music
_____ Make friends
_____ Become a better musician
_____ For general enjoyment

Q12 How often do you share the following within music group members (e.g., choirs, orchestras, etc.)?

	Daily	Few Times a Week	Few Times a Month	Few Times a Year	Almost Never	Never
1. Digital music files	☐	☐	☐	☐	☐	☐
2. Links of music online	☐	☐	☐	☐	☐	☐
3. Sheet music	☐	☐	☐	☐	☐	☐
4. Music relevant information	☐	☐	☐	☐	☐	☐
5. A device for listening to music	☐	☐	☐	☐	☐	☐
6. An account of music streaming service	☐	☐	☐	☐	☐	☐

Survey questionnaire used in Chapter 4

Q13 How often do you share the following with people outside of your music groups?

	Daily	Few Times a Week	Few Times a Month	Few Times a Year	Almost Never	Never
1. Digital music files	☐	☐	☐	☐	☐	☐
2. Links of music online	☐	☐	☐	☐	☐	☐
3. Sheet music	☐	☐	☐	☐	☐	☐
4. Music relevant information	☐	☐	☐	☐	☐	☐
5. A device for listening to music	☐	☐	☐	☐	☐	☐
6. An account of music streaming service	☐	☐	☐	☐	☐	☐

Q14 Do you agree or disagree with each of the following statements? (1 - Disagree strongly; 2 - Disagree; 3- Disagree somewhat; 4 - Neither disagree nor agree; 5- Agree somewhat; 6- Agree; 7- Agree strongly)

Perceived usefulness
Music streaming services have played a role in my music development.
Music streaming services play a valuable role in my music group.
Overall, I found music streaming services useful in my life.
Perceived ease of use
I can use music streaming services without any difficulty.
Learning to use music streaming services was easy.
Overall, I found music streaming services easy to use.
I can use music streaming services without any difficulty.

UK15 We are interested in any concerns you might have about using music streaming services. Please answer every question using the scale provided. Are you concerned about...? (1 - Not at all; 2 - Slightly; 3 - Somewhat; 4- Moderately; 5- Very much)

The worthiness of buying a membership plan
The interface being not easy to use.
Bad quality of music
People I don't know obtaining my personal information with my online activities.
Online identity theft.
That I might lose my music.
My privacy in general.

UK16 Using music streaming services has enabled me to ... (1 - Disagree strongly; 2 - Disagree; 3- Disagree somewhat; 4 - Neither disagree nor agree; 5- Agree somewhat; 6- Agree; 5- Agree strongly)

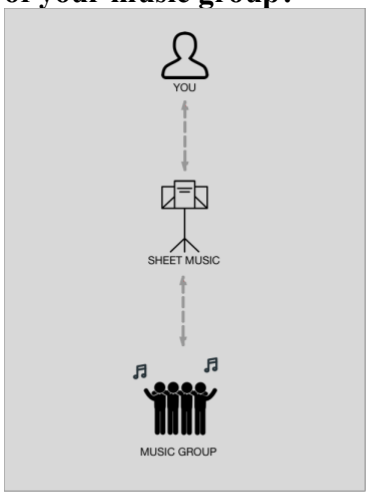
Feel confident with Information Technologies
Keep up with relevant music events
Learn a lot about music

Discover new music
Strengthen my relationship with my friends
Strengthen my relationship with my family
Feel more satisfied with life
Feel influential

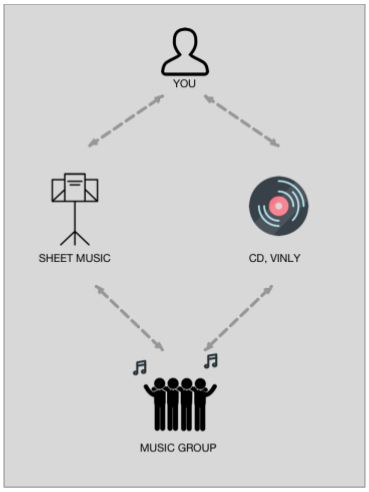
Q17 If use the following, how likely are you to increase in the future?

	Extremely unlikely (1)	Moderate unlikely (2)	Slightly unlikely (3)	Neither (4)	Slightly likely (5)	Moderate likely (6)	Extremely likely (7)
Amazon Prime Music	☐	☐	☐	☐	☐	☐	☐
Last.FM)	☐	☐	☐	☐	☐	☐	☐
Napster	☐	☐	☐	☐	☐	☐	☐
SoundCloud	☐	☐	☐	☐	☐	☐	☐
Spotify	☐	☐	☐	☐	☐	☐	☐
YouTube	☐	☐	☐	☐	☐	☐	☐
Facebook	☐	☐	☐	☐	☐	☐	☐
Twitter	☐	☐	☐	☐	☐	☐	☐

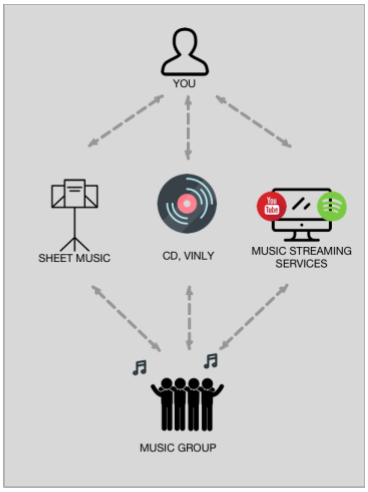
UK18 Which of the following three visualisations is most similar to your own experience of your music group?



(A) Level 1: sheet music only



(B) Level 2: sheet music and physical media



(C) Level 3: sheet music, physical media and music streaming services

UK19 These questions ask you about your confidence in how well you can perform more specific tasks. For each statement click a number from 0% to 100% to indicate how confident are you to do the following?

	0 100
Deal with email attachments	
Enter a URL in a web browser	
Find information by using a search engine	

Find a piece of music on the Internet
Transfer music between two digital devices
Use downloaded music files from the Internet
Create a web page
Find an App to serve my needs
Transfer physical music (e.g., vinyl) to a digital device (e.g., computer)

CAM19 Please estimate how confident you are that you could do each of the following items. Rate your degree of confidence from 0 to 100 where a 0% confidence means that you cannot do it at all, a 50% confidence means that if you gave it your best effort, chances are about 50-50 that you could perform the activity, and a 100% confidence means that you are certain you can do it. You can use any score between 0 and 100 (20, 30, 40, etc) to express your confidence. How confident are you about your skills/abilities to

	0 100
Read e-mail messages	
Send e-mail messages	
Save the files attached to e-mail	
Enter a URL in the browser	
Return to previously visited web pages without being lost	
Find information by using a search engine	
Find information in an online data base	
Find a piece of music on the Internet	
Post a message on Facebook	
Post a message on Twitter	
Post a query in a discussion to forum	
Answer a question in a discussion forum	
Transfer music between two devices	
Use downloaded music files from the Internet	
Upload music/video on YouTube	
Direct someone else to a video/music on YouTube	
Use online services to store, sync, and share documents and media files	
Create a web page	
Find an App to serve my needs	
Create a playlist on Spotify	
Use all the facilities offered by the Information Technology at home	

Q20 Who is the best at using Information Technology in your household?

- ☐ You
- ☐ Your partner
- ☐ One of your children
- ☐ Your parents
- ☐ Other _____

Q21 Is this person more or less capable than an average person?

- Much less than
- Less than
- Somewhat less than
- The same as
- Somewhat more than
- More than
- Much more than

Q22 Are you more or less competent in technology than a typical person in your network of friends?

- Much less than
- Less than
- Somewhat less than
- The same as
- Somewhat more than
- More than
- Much more than

Q23 Are you currently _____?

- In education
- Employed
- Retired
- Seeking employment

[Display this question if semi-retired is selected]

Q24 How long have you been retired from your full-time job?

- Less than 1 year
- 1-4 years
- 5-10 years
- More than 10 years

[Display this question if employment is selected]

Q25 How long have you been employed for the current job?

- Less than 1 year
- 1-4 years
- 5-10 years
- 11-20 years
- 21-30 years
- More than 30 years

[Display this question if employment or semi-retirement is selected]

Q26 Computers are (were) extensively used in my workplace.

- Disagree strongly
- Disagree somewhat
- Neither agree nor disagree
- Agree somewhat
- Agree strongly

[Display this question if employment or semi-retirement is selected]
Q27 I (used to) use the computer _____ than an average person in my workplace.

- Much Less
- Less
- Somewhat Less
- The Same
- Somewhat More
- More
- Much More

[Display this question if employment or retired or semi-retired is selected]
CAM28 What is(was) the percentage of your time in a typical day at work requires you to _____?

	0-20%	21-40%	41-60%	61-80%	81-100%
Read online webpage	☐	☐	☐	☐	☐
Handle emails	☐	☐	☐	☐	☐
Use IT for other purposes	☐	☐	☐	☐	☐

[Display this question if employment or semi-retirement is selected]
Q28 I often need the help of IT professionals for problems of using computers in work.

- Disagree strongly
- Disagree somewhat
- Neither Agree nor Disagree
- Agree somewhat
- Agree Strongly

Q29 Do you agree or disagree with each of the following statements? (1 - Disagree strongly; 2 - Disagree; 3- Disagree somewhat; 4 - Neither disagree nor agree; 5- Agree somewhat; 6- Agree; 7- Agree strongly)

Group identity in music
In general, belonging to the group is an important part of my self-image
The group(s) I belong to is (are) an important reflection of who I am
To me, pleasure is spending time with others
My happiness depends very much on the happiness of those around me
Self-identity
I often do “my own thing”
I enjoy being unique and different from others in many ways

Segment identity
In different situations, I often act like very different persons
I'm not always the person I appear to be
I guess I put on a show to impress on entertain others
I prefer to keep different parts of my life separate
Satisfaction with Life
I am more satisfied with my life than six months ago

Q30 Think of this ladder as representing where people stand in your country. At the top of the ladder are the people who are the best off - those who have the most money, the most education and the most respected jobs. At the bottom are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom. Where would you place yourself on this ladder? Please select the number (1-10) on the rung where you think you stand at this time in your life, relative to other people in our country.

Finally, we have some questions about you.

Q31 What is your gender?

- Male
- Female

Q32 In which year were you born?

Q33 What is the highest degree or level of school you have completed?

- GCSE / O-Level / CSE
- A-level
- Undergraduate
- Master Degree
- Doctoral Degree
- Professional Degree (JD, MD)
- Not sure

Q34 Considering your monthly income, after you pay the essentials, what percentage of your discretionary do you spend on music related activities?

- 0-25%
- 26%-50%
- 51%-75%
- 76%-100%

Q35 Are you involved in music as part of religion?

- Yes
- No
- Used to be

Rather not to say